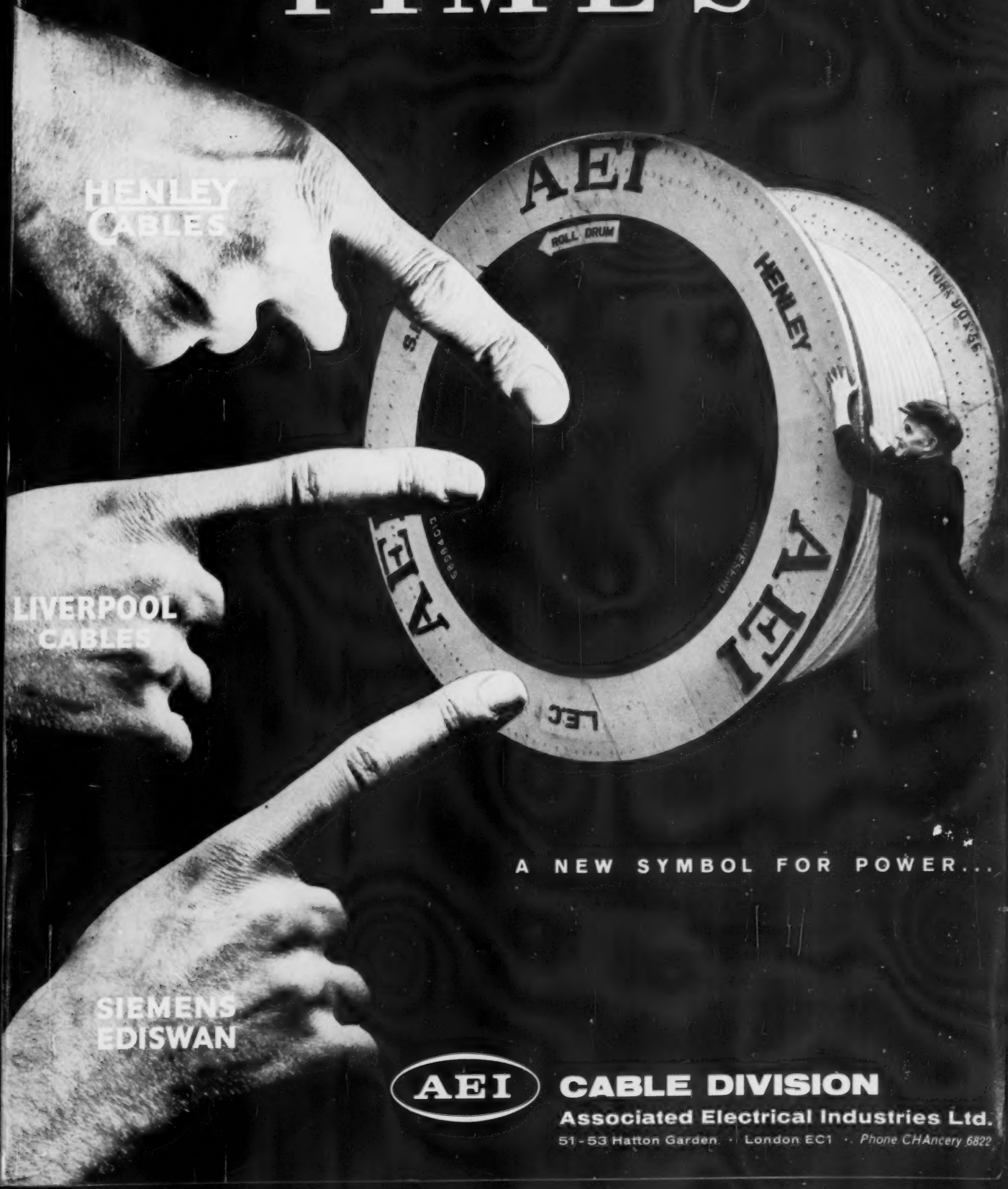
ELECTRICAL TIMES



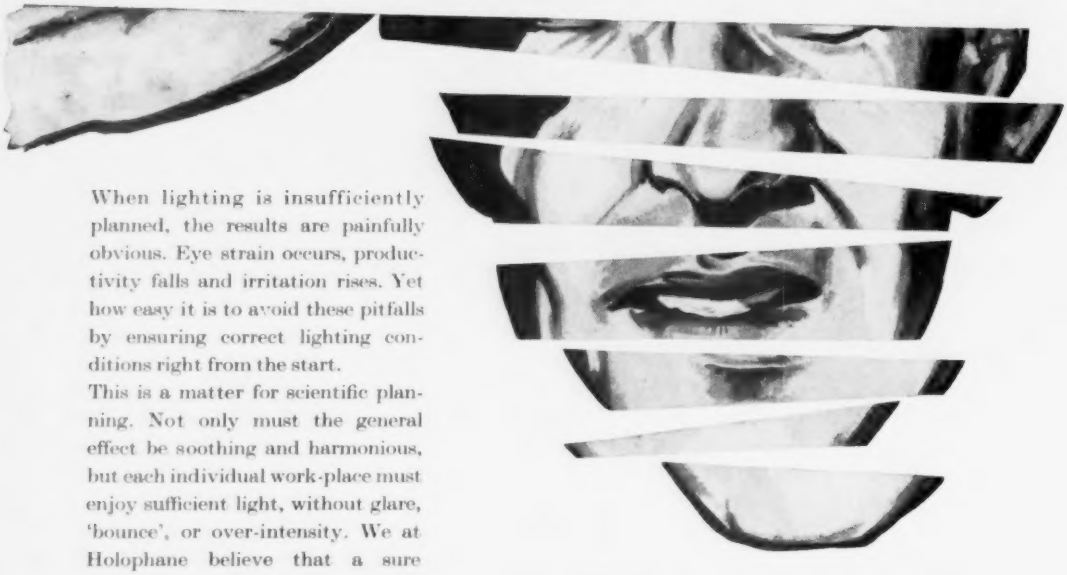
A NEW SYMBOL FOR POWER...

AEI **CABLE DIVISION**

Associated Electrical Industries Ltd.

51-53 Hatton Garden · London EC1 · *Phone CHAncery 6822*

HAS SOMEONE MADE A GLARING MISTAKE HERE?



When lighting is insufficiently planned, the results are painfully obvious. Eye strain occurs, productivity falls and irritation rises. Yet how easy it is to avoid these pitfalls by ensuring correct lighting conditions right from the start.

This is a matter for scientific planning. Not only must the general effect be soothing and harmonious, but each individual work-place must enjoy sufficient light, without glare, 'bounce', or over-intensity. We at Holophane believe that a sure remedy for these ills is . . . *scientific control*—an aspect of lighting which has occupied our engineers and research staff for upwards of sixty years.

If you would like details of how our unique prismatic reflectors and refractors can contribute to productivity, cheerfulness and general goodwill in any establishment, why not get in touch with us by letter or telephone right away?

HOLOPHANE

SCIENTIFICALLY CONTROLLED LIGHTING

HOLOPHANE LIMITED ELVERTON STREET
WESTMINSTER · LONDON S.W.1 · Telephone: VICtoria 8062

AVO INSTRUMENTATION

AVO instruments are in permanent use at many oil refineries

D.C. Amplifiers
Radiation Monitors
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Multi-range Testmeters
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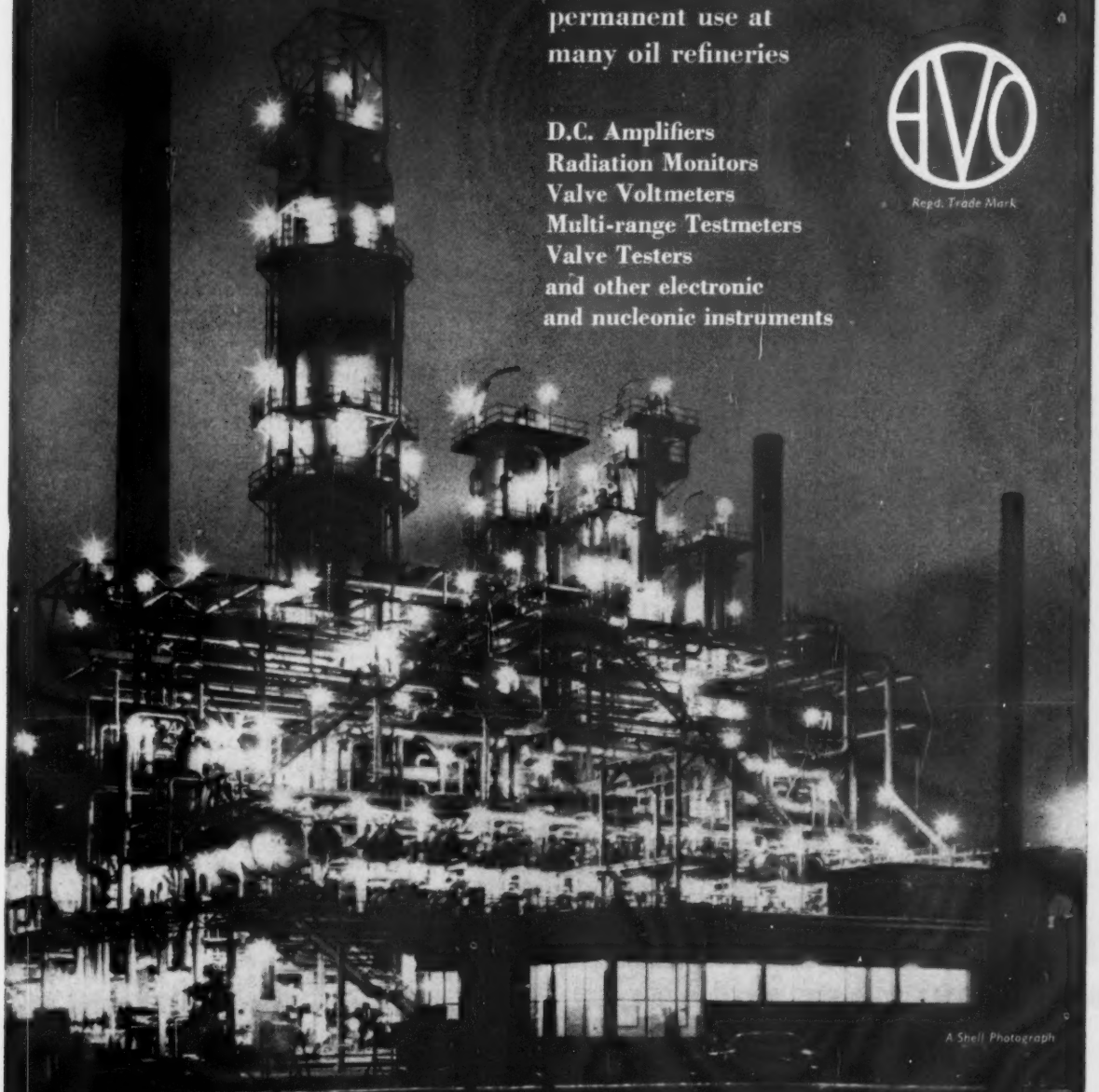
and other electronic and nucleonic instruments

AVO
Regd. Trade Mark



A Shell Photograph

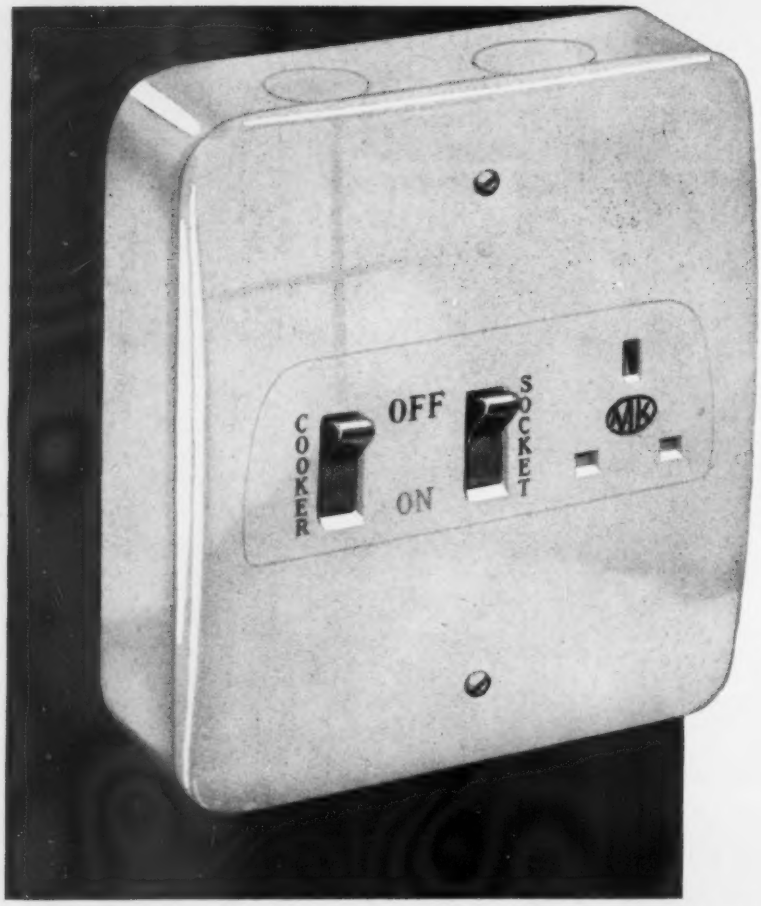
AVO LTD AVOCET HOUSE · 92-96 VAUXHALL BRIDGE ROAD · LONDON · S.W.1
Telephone: VICtoria 3404 (12 lines) Cables: Avocet, Sowest, London

G22

A MEMBER OF THE METAL INDUSTRIES GROUP OF COMPANIES.

A

REDUCED PRICES FOR MK COOKER CONTROL UNITS



Substantial price reductions have been made possible by retooling and improved manufacturing technique. At the same time improvements in design and quality have been embodied.

✻ **EPOXY ENAMEL FINISH**

This well-known quality of enamel is renowned for high surface finish, superior adhesion, corrosion resistance and general durability. Epoxy enamel is spray-applied and stoved at high temperature to the zinc-coated steel boxes and lids, which are Bonderised after forming.

✻ **ADDITIONAL EARTH TERMINAL**

This is attached direct to the chassis, in addition to the existing earthing terminal in the base of the box.

✻ **EXTRA FIXING HOLES**

Metalclad units now have additional fixing holes on 2¾" centres in the base of the box, in order that they may be fixed over a BS 1299/1363 box sunk in the wall.

✻ **COPPER INTERCONNECTIONS**

The interconnecting straps between main switch terminals and socket contacts have been changed from brass to solid copper, to avoid corrosion due to season cracking in moist conditions.

* * *

Metalclad Cooker Control Units comply with BS 438 and BS 1833 so far as is relevant. Available with 13 amp (Rectangular Pin) Shuttered Socket-Outlets to BS 1363 and also 15 amp (Round Pin) Shuttered Socket-Outlets to BS 546. Surface or Flush mounting with or without Pilot Indicating Lamps. A range of All Insulated Surface Mounting Cooker Control Units are also available.

M.K. FOREMOST FOR VALUE IN COOKER CONTROL UNITS

Have you received Leaflet No. 254?

MK

M.K. ELECTRIC LIMITED, SHRUBBERY ROAD, EDMONTON, LONDON, N.9. EDMONTON 5151

MK 178 DHB

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Our friends in the electrical industry will be pleased to know that there will be no change in the manufacture and marketing of our unique product, the pre-impregnated non-draining paper insulated cable, together with our established range of mining and plastic mains cables.

We are justly proud of our past achievements amongst which are: the introduction of the first inherently non-draining cable; the first super voltage paper insulated mining shaft cable; the first gas pressure cable system in this country; the largest United Kingdom exporter of super tension cables in recent years.

It is on this foundation that the reputation of Glovers has been established and we are confident of our ability to maintain our position as one of the leading cable manufacturers.

This Company will continue to play a significant part in the progress and development of the electrical industry.

It is our prime objective to provide an independent sales service, backed by the specialist resources of our Technical Organisation, to meet the individual needs of our customers.

We are a Company with a tradition and a future.

You, too, can have confidence in Glovers

BY APPOINTMENT TO H.M. QUEEN ELIZABETH II ELECTRIC CABLE MANUFACTURERS

W. T. GLOVER & CO. LTD.

TRAFFORD PARK MANCHESTER 17

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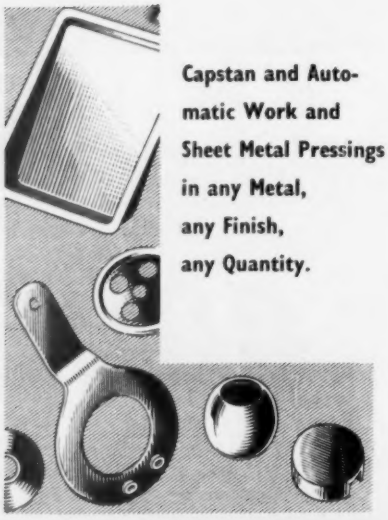

Capstan and Automatic Work and Sheet Metal Pressings in any Metal, any Finish, any Quantity.

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AND COMPANY LIMITED
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BIRMINGHAM, 18
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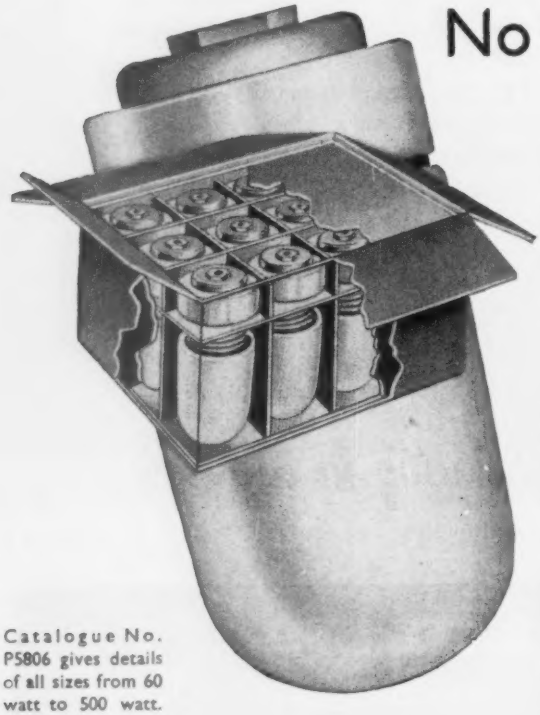


Catalogue No. P5806 gives details of all sizes from 60 watt to 500 watt.

No **CASE** for complaint

With R.E.A.L. Watertight Fittings supplied by the dozen in this rail-certified container, customers can be certain that they'll arrive in perfect condition, with no lost rubber rings or lampholders . . . no straw-covered glass to clean . . . no breakages. Just a part of the service—R.E.A.L. service!

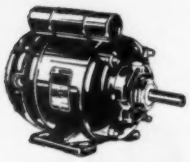
REAL

Watertight Fittings

Patent No. 568702

PERFECT PROTECTION IN THE PERFECT PACK

R.E.A.L. *is the registered trade mark of*
ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. Works, Birmingham, 18



THEY ALL CHOSE AEI FRACTIONALS

... I wanted a light-power 'fractional' with resilient base

I wanted a special endshield mounting...

... I wanted a permanent-split capacitor motor

Whatever the project, if you are producing machinery to be powered by a.c. or d.c. motors of up to one h.p., consult AEI engineers at the design stage. The wide choice of fractionals they can offer gives you greater scope for producing machinery of improved design and performance. AEI experts have almost certainly met problems similar to yours already, and their valuable experience and knowledge are at your service.

OUR ADVISORY SERVICE FOR DESIGNERS

will save you time and money

Consult AEI engineers *at an early stage* and make sure of getting the *right* f.h.p. motor for the job! Many types and sizes from 1/500 h.p. are available, with every conceivable kind of mounting or fitting, and many of these are available from stock. You can thus combine maximum efficiency and reliability with the most compact, practical, and attractive design.

AEI

Associated Electrical Industries Limited

Motor and Control Gear Division

F.H.P. MACHINES SALES

NEWCASTLE, STAFFORDSHIRE, ENGLAND

B T-H *INCORPORATING THE MOTOR AND CONTROL GEAR INTERESTS OF BTH AND M-V* M-V

A5394

It's the cooker for HER!

The Belling 48T is your customer's dream of a perfect cooker come true. We designed it after questioning thousands of women at exhibitions and demonstrations. It has been built to the highest specification, with a galaxy of easy-to-use and easy-to-clean features. So tell your customers about it and display it where it can speak for itself.

EXCLUSIVE REMOVABLE OVEN ROOF AND LINING
THE TEN TOP FEATURES OF THE BELLING 48T
• Eye-level controls.
• New Smith's Auto-timer and Electric Clock.
• Lift-off oven door and inner glass door.
• Automatic oven lighting.
• Large hotcupboard with drop-down door.
• Fast-boiling 8" Radiant plate.
• Chromium plate trims and bumper bar.
• Handy drawer for warming and storage.
• Rollers at back for easy moving.
• Vitreous enamel throughout including hob, door panels and side panels.

AND FOR YOU TOO!

NO ASSEMBLY NEEDED

Delivered complete with control panel already fitted and wired—no need for you to do any assembly work.

EASY TO INSTALL

Simply remove the small inspection panel on the back to gain access to the mains terminals. No need at all to remove back or sides.

"Belling"

48T AUTO-TIMER COOKER £51

48AB without Auto-timer **£45. 15. 0**

BELLING & CO. LTD., ENFIELD, MIDDLESEX, ENGLAND

CRC 476

Substantial

PRICE REDUCTIONS

FROM 20th JUNE

on

Essex Range

(Patent No. 833412)

FLUORESCENT FITTINGS

and many other fittings and accessories

New price lists giving details of these important reductions are being mailed now. Additional copies can be obtained from Area Sales Offices.

EKCO-ENSIGN ELECTRIC LIMITED

45, ESSEX STREET, STRAND, LONDON W.C.2 **Telephone CITY 8951**

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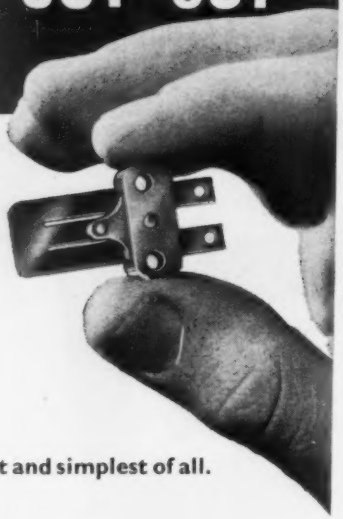
EL 72

NEW Otter 'PUP' REGD.

Safety CUT-OUT



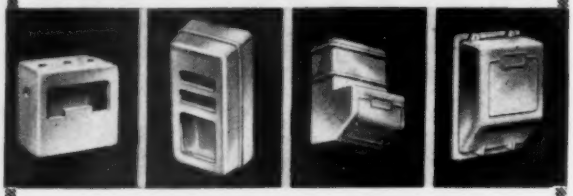
World Patents including Patent Numbers 600055, 622781, 624905, 657434, 713443, 749716, 774911, 782668, and others. Also other patents pending.

* Easily the safest and simplest of all.
* Has only one moving part.
* Patented "Otter" snap action.
* They PRESS their contacts together to open them with a snap!
* The lowest priced reliable thermostat.

Otter Pups are suitable for the protection of Portable Electric Heaters, Convector Heaters, Hair Dryers, Clothes Dryers and for accurate temperature control, especially where space for the thermostat is limited.

OTTER CONTROLS LIMITED
OTTERS' OLE, BUXTON, DERBYSHIRE
Phone Buxton 650 (2 lines)

Switch to DEANS'
Fibreglass-Reinforced Plastic
Light · Corrosion-resistant · Economical



DEANS HAVE CAPACITY FOR QUANTITY—PRODUCTION AVAILABLE IN MOST MODERN FACTORY

Enormous strength, high insulation properties, resistance to corrosion and adaptability for producing complex shapes all combine to make Fibreglass-Reinforced Plastic ideal for switchboxes, control gear housing, switchcovers, etc. Deans specialise in the production of these, by the matched-metal die process, which ensures good surface finish and close working tolerances.
Deans technicians will be glad to advise on any technical matters concerning fibreglass applications—or to receive enquiries for repetition work.

Deans
DEANS & SON (YORKSHIRE) LTD.
Beverley, Yorkshire, England
A member of the Manganese Bronze Group

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VIR TB&C
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VIR HSOS
VIR LEAD COVERED
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BSS 1116 QUARRIES
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BSS 559 NEON LIGHTING
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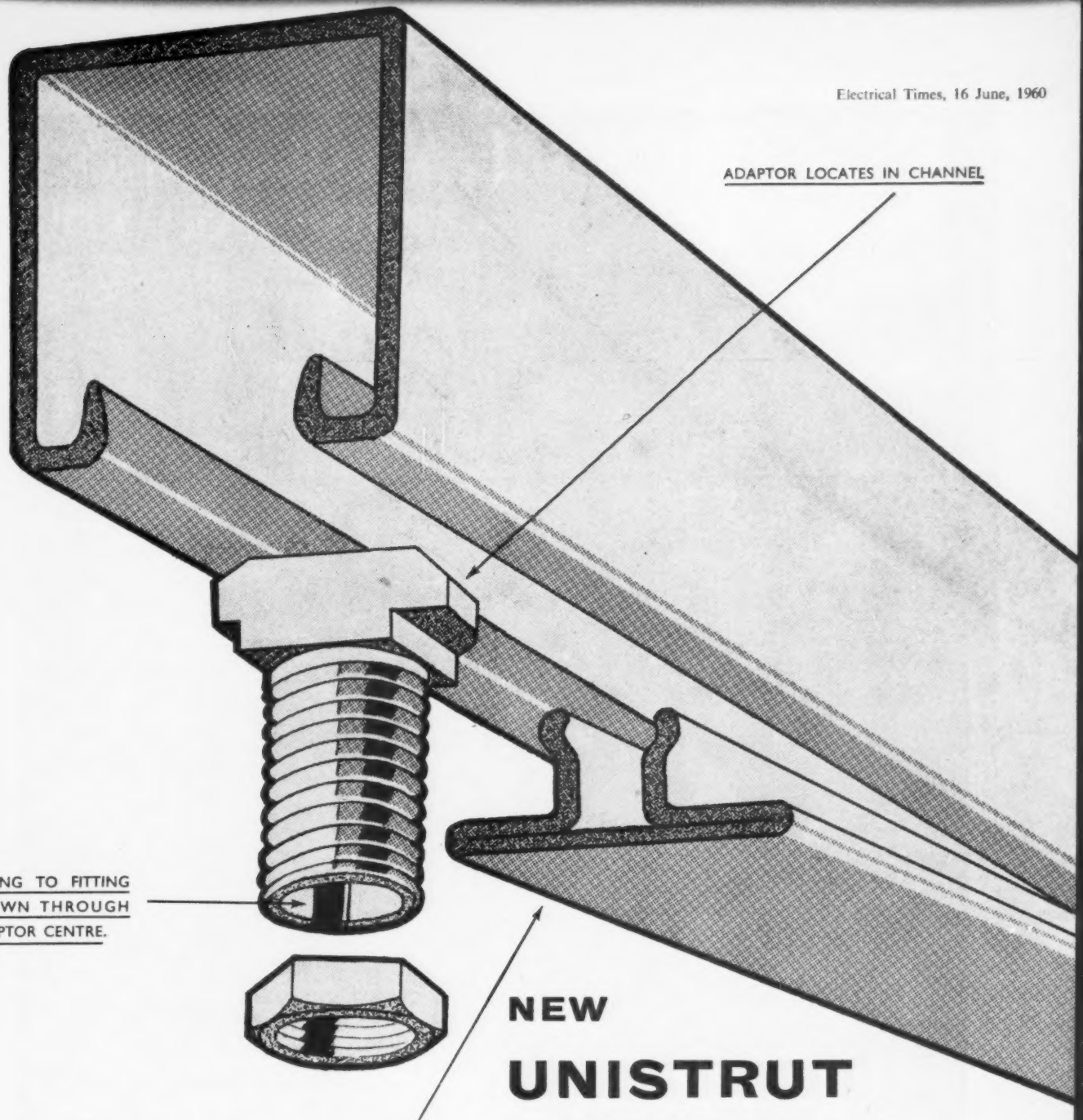
THERMOPLASTIC

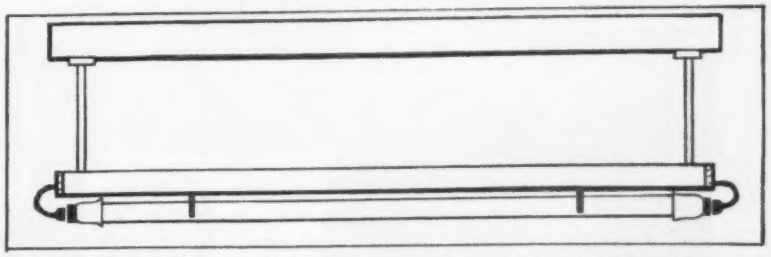
MADE AND TESTED TO BRITISH STANDARD SPECIFICATIONS

WILLIAM GEIPEL LTD.
HEAD OFFICE 156-170 BERMONDSEY ST · LONDON · S.E.1
CABLE WORKS WEMBLEY


ADAPTOR LOCATES IN CHANNEL
WIRING TO FITTING DRAWN THROUGH ADAPTOR CENTRE.
WIRING IN CHANNEL CONCEALED BY PUSH-IN COVER STRIP.

NEW
UNISTRUT
FLUORESCENT
LIGHTING ADAPTOR

NEATER—MORE ECONOMICAL.



With this new component, attachment of fluorescent fittings to Unistrut channel (still the cheapest and neatest trunking) is made even simpler. The fittings may be attached either direct as shown above, or on droppers of ¾" conduit attached by a standard socket to the male thread of the adaptor. In either case, wiring is drawn from the channel through the centre hole of the adaptor which is of brass for good earthing. The end of the adaptor which fits inside the channel is shaped like the normal Unistrut nut, to combine positive location with easy adjustment of position.

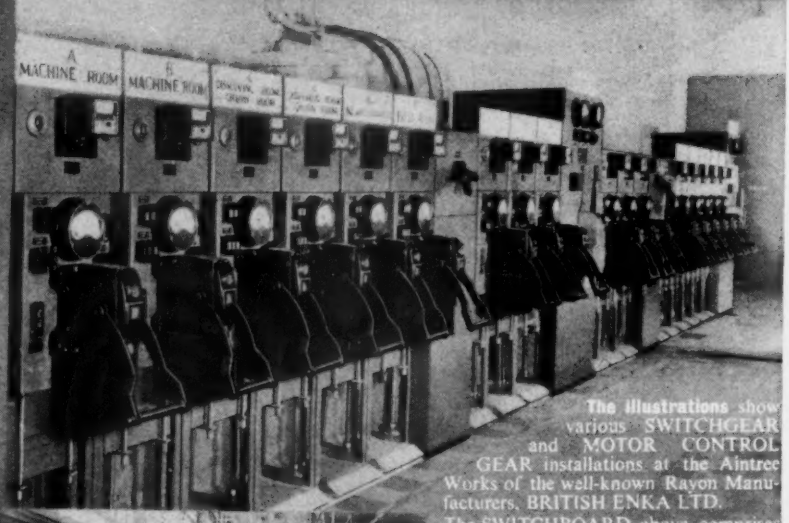
UNI/619

For drawing and details of the new component to bring your Parts Catalogue up to date, or general information on the Unistrut system in fluorescent trunking and all electrical applications, please write to:

GKN UNISTRUT DIVISION OF SANKEY-SHELDON LTD.

43/45 Broadwater Road, Welwyn Garden City, Herts. *Telephone: Welwyn Garden City 6321 (4 lines)*

"Erskine Heap" installation at BRITISH ENKA LTD.,

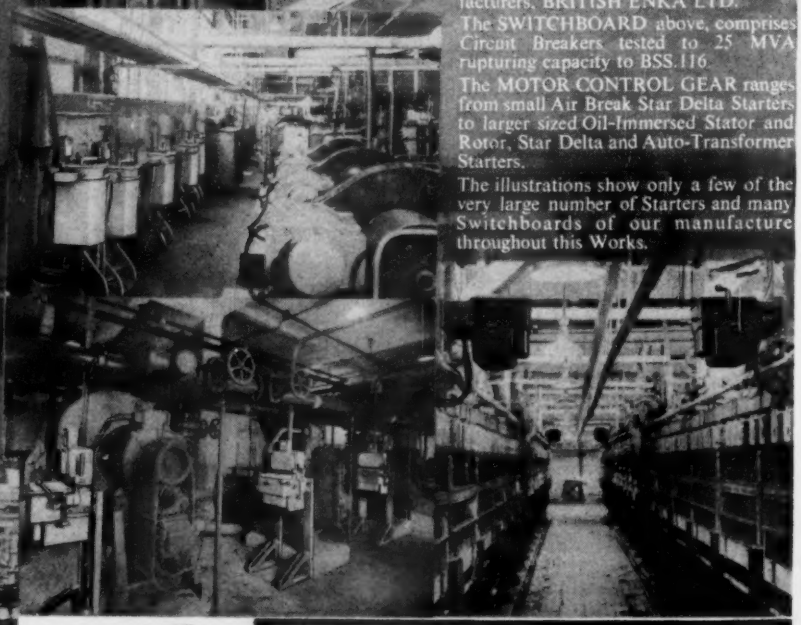


The illustrations show various SWITCHGEAR and MOTOR CONTROL GEAR installations at the Aintree Works of the well-known Rayon Manufacturers, BRITISH ENKA LTD.

The SWITCHBOARD above, comprises Circuit Breakers tested to 25 MVA rupturing capacity to BSS.116.

The MOTOR CONTROL GEAR ranges from small Air Break Star Delta Starters to larger sized Oil-Immersed Stator and Rotor, Star Delta and Auto-Transformer Starters.

The illustrations show only a few of the very large number of Starters and many Switchboards of our manufacture throughout this Works.



May we have your enquiries?

ERSKINE, HEAP & Co LTD

SWITCHGEAR SPECIALISTS

Head Office & Works: BROUGHTON, MANCHESTER (7)

London Office: GRAND BUILDINGS TRAFALGAR SQ., W.C.2

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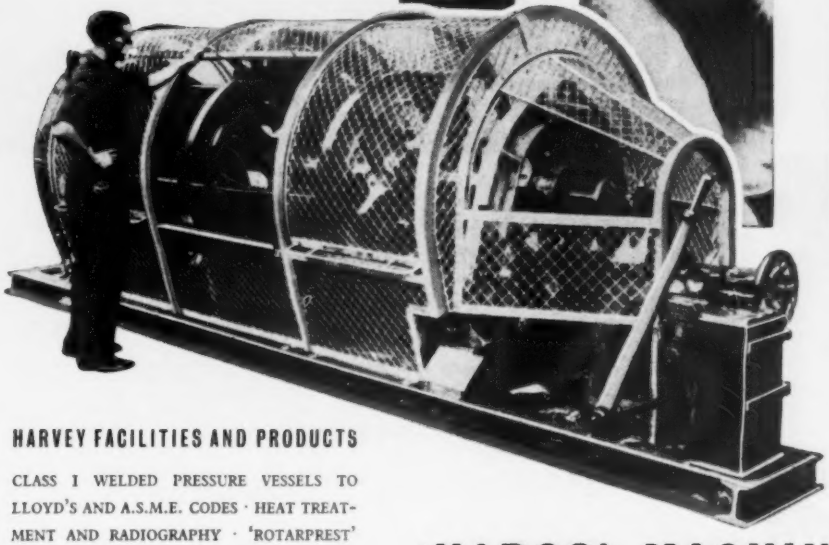
695

SENSIBLE SAFETY

Everybody understands why dangerous animals have to be kept behind bars, and so instances of people being injured by caged wild animals are fortunately rare.

Moving machinery and tools can also inflict serious injury, and it is no less important that these, too, should be securely guarded and fenced.



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'HARCO' MACHINERY GUARDS

'Harco' Machinery Guards are purpose made for every type of machinery, and are constructed to afford complete protection without interfering with efficient operation. They are strongly made from stout wire mesh to withstand vibration and rough treatment, and all 'Harco' Guards fully conform to Factory Act requirements. The complete Harvey service covers advice, design and installation, and List No. 996 shows many types already supplied.

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CLASS I WELDED PRESSURE VESSELS TO LLOYD'S AND A.S.M.E. CODES · HEAT TREATMENT AND RADIOGRAPHY · 'ROTARPREST' HEADS FROM 5 FT. TO 15 FT. DIA.—*Larger sizes to specification* · WELDED PRESSURE VESSELS AND FABRICATIONS IN ALL METALS STEEL PLATE AND SHEET METALWORK HEAVY MACHINING AND FITTING PERFORATED METALS · WOVEN WIRE WIREWORK · STEEL STORAGE EQUIPMENT

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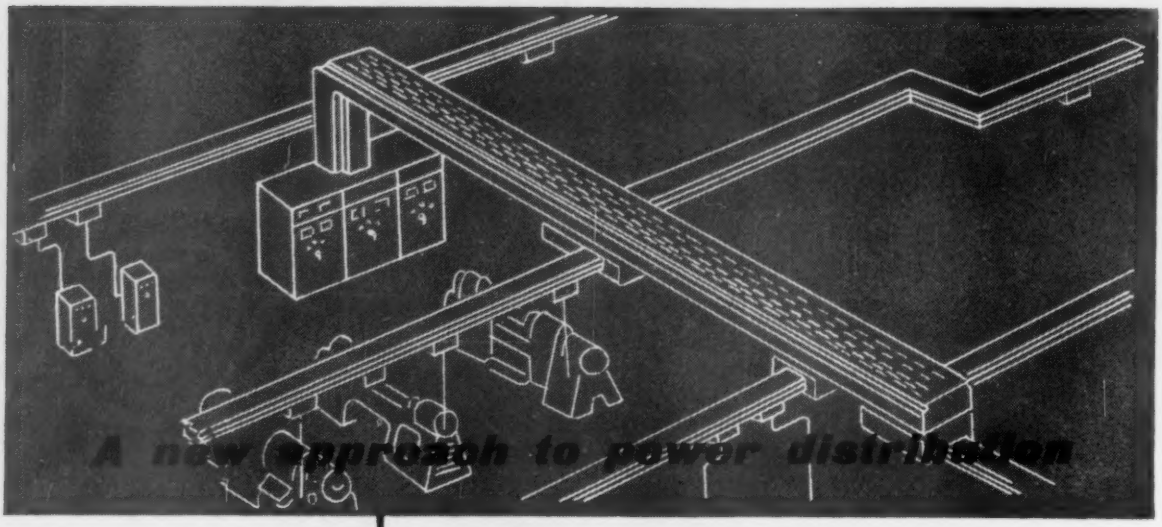
G. A. HARVEY & CO. (LONDON) LTD., WOOLWICH ROAD, LONDON, S.E.7

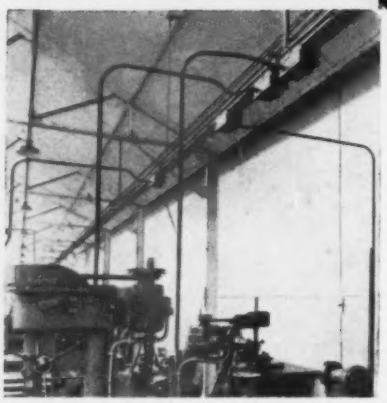
Telephone: GREenwich 3232 (22 lines)

WW/3



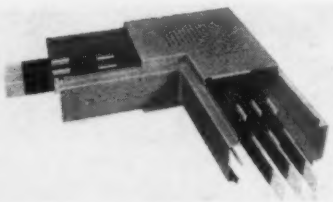
ECONOMICAL
FLEXIBLE
SAFE TAP-OFF BOXES
SILVERED CONTACTS AT JOINTS

British CANALIS BUSBAR TRUNKING

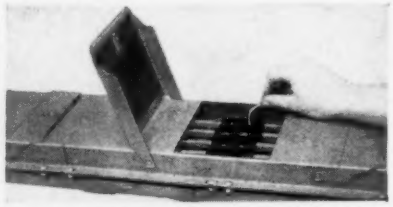


British Canalis Universal applied to workshop distribution. Tap-off boxes easily located adjacent to machine.

- HEAVY STEEL CASING.
- PLUG-IN TAP-OFF BOXES FEED SERVICE CIRCUITS AND ARE FIXED WITHOUT TOOLS.
- OPENING LID OF BOX AUTOMATICALLY DISCONNECTS FROM BUSBARS.
- CONTINUOUS EARTH BAR.
- EASY TO ERECT.



Corner section of heavy current trunking of 1,500 amps rating showing interleaved busbars.



Method of joining sections of British Canalis Universal.

BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH

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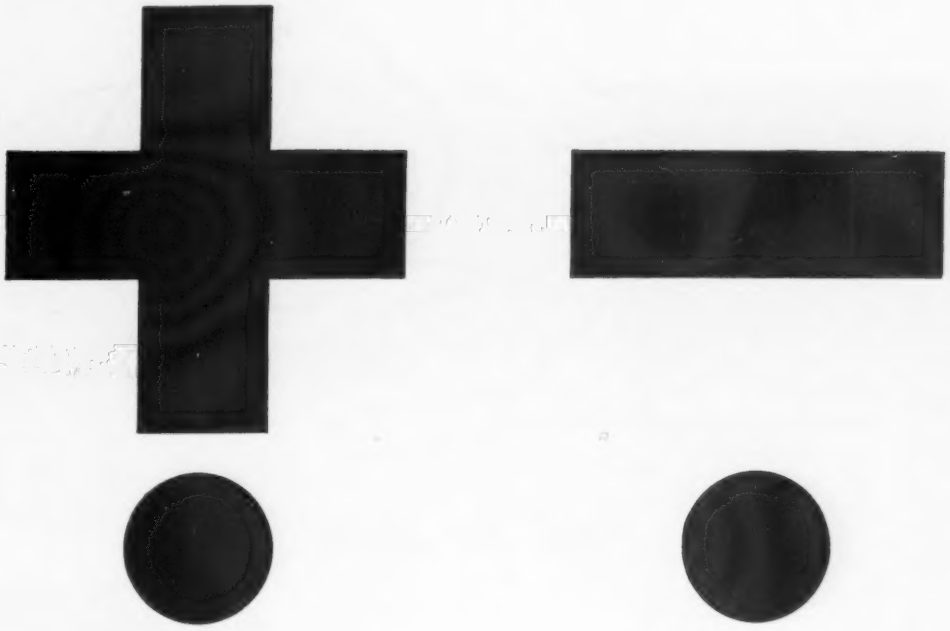
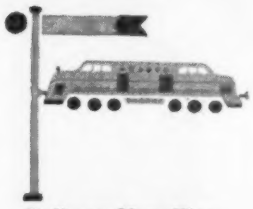
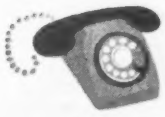


Everything depends on Siemens Ediswan Primary Batteries

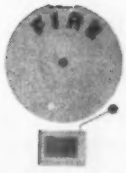


Railway Signalling



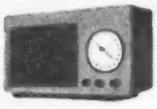
Telephones

Telegraphs



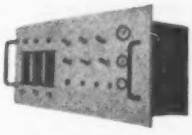
Fire & Burglary Alarms

Ships' Control Equipment



Radio Receivers
(Valve and Transistor)

Pocket Torches



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Radio and Electronic Components Division

Primary Batteries Department

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AEI

CRC12A/5

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Engine Starting
Automobiles, aeroplanes and stationary engines.

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Emergency steering, lighting and alarm signalling.

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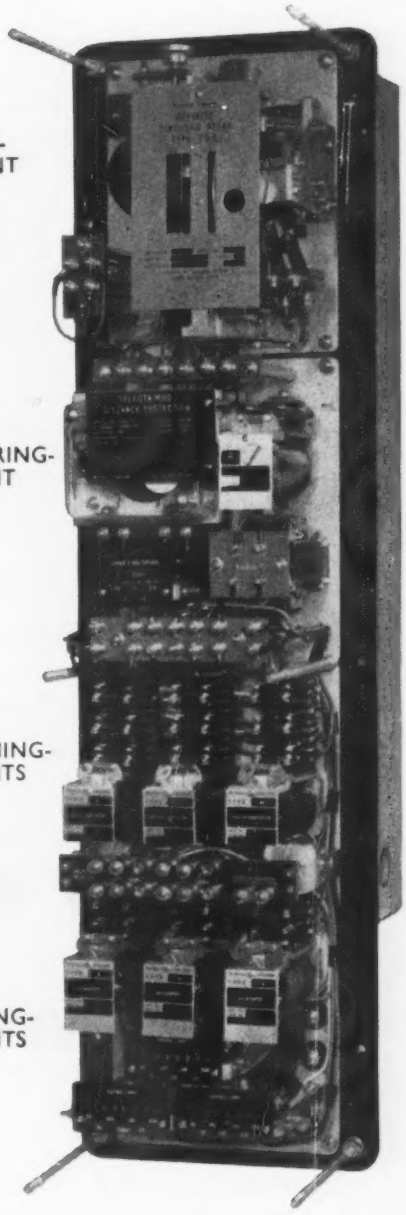
based on the world-renowned TYPE-H PROTECTION



Selecta-mho has been specially designed for those systems in which the utmost economy is essential.

Saves on first cost, which is less than half that of conventional systems.

Saves on installation and maintenance, because all equipment is static and only one measuring-element is used.

Saves on panel space, which is less than quarter of that of conventional systems.

High standard of technical performance

Short delivery

Reyrolle

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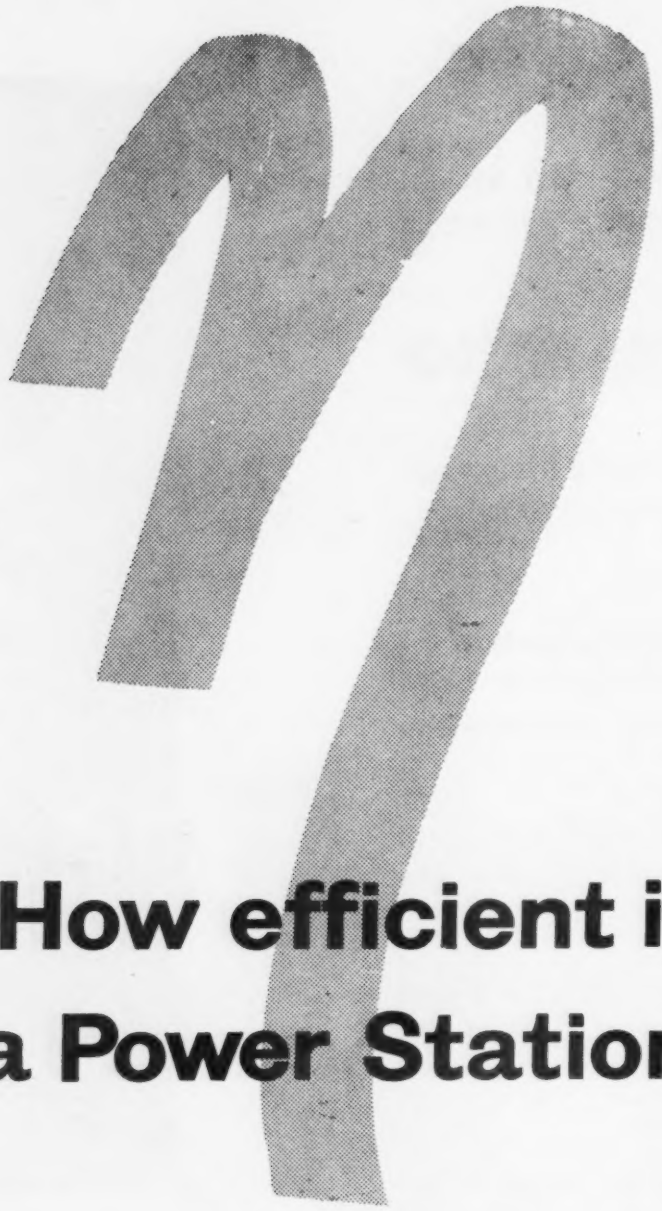

How efficient is a Power Station?

The term 'efficient' is often used loosely as an alternative to 'effective'. In Electricity Supply, however, the 'efficiency' of a power station has a well-defined and exact connotation. It indicates the heat energy expended to produce a unit of electricity.

Progressively, new power stations are more 'efficient' than their predecessors — they burn less coal for a given output. The engineers of the Central Electricity Generating Board are producing designs which, by increasing efficiency, enable power stations to offset substantially the rising costs of materials.

In spite of increased efficiency, however, the available supply of suitable coal cannot long keep pace with the demand for electricity, which doubles every decade. The gap that threatens in the not distant future will now be filled by the rapidly expanding nuclear power programme.

C E G B

THE CENTRAL ELECTRICITY GENERATING BOARD

NEWS SHEET

In the Birthday Honours List, knighthoods for C. R. King (K.B.E.) and W. H. McFadzean. Dr T. E. Allibone awarded C.B.E. (976)

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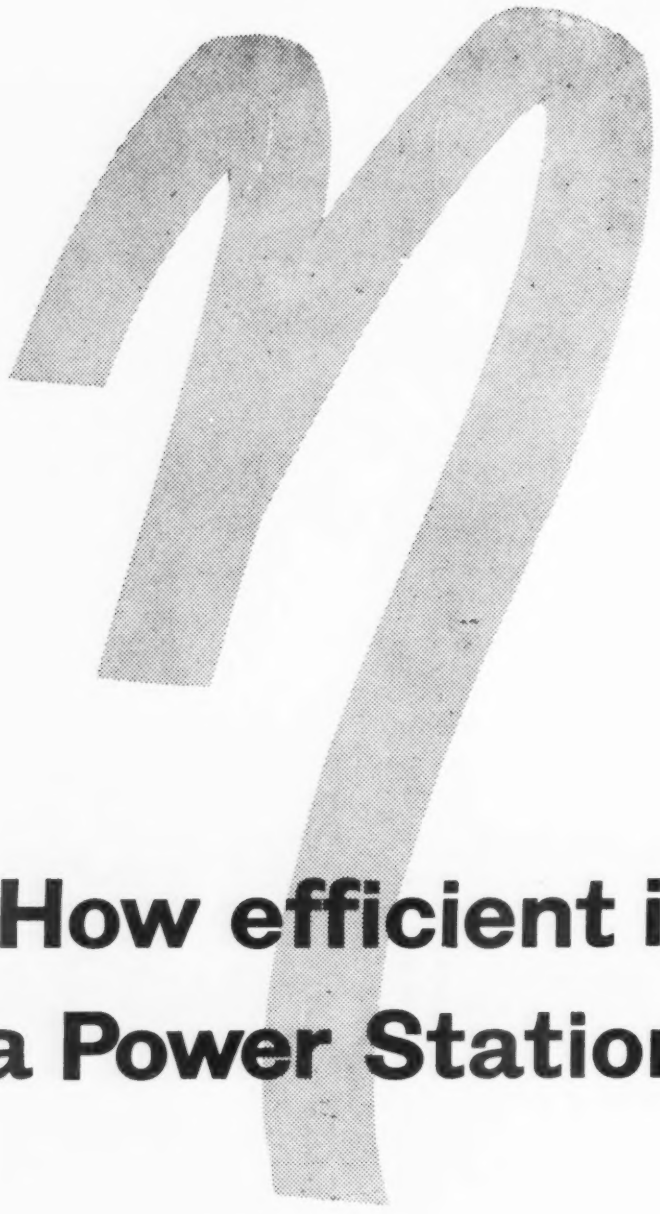
Water cooling of power cables can double current-carrying capacity suggest tests by CEGB-Pirelli at Uskmouth. 132 kV oil-filled cables operated in two forms, one with polythene pipes alongside, the other with integral cooling channels above reinforcing tapes. (957)

New company mergers and agreements: New £100,000 Anglo-US electronics company, LCE Ltd., formed, Joseph Lucas participating, Lord Halsbury chairman; (986) . . . Steatite and Porcelain Products link with Cie General d'Electro-Ceramique for technical collaboration and mutual marketing; (985) . . . Ross Courtney to make and sell US range of terminals and closing mechanisms; (986) . . . German tie-up in refrigerators for Merseyside Engineering; (985) . . . English Telephone Co. acquire 47% capital of E. Shipton, reciprocal share deal planned to complete merger. (986)

PEOPLE—W. B. Poulter becomes member Southern EB . . . H. V. Billing is new LEB Essex Suburban district manager . . . R. V. Ely resigns from boards of Lancashire Dynamo Holdings and subsidiaries . . . BICC appoint B. Hollingworth asst. sales manager (mining) . . . Southern Project Group's four new resident site engineers are L. W. G. Mason (Dungeness), M. V. Horsfield (Belvedere), A. Hanlon (Northfleet) and S. F. Mogridge (Bankside). (977, 978)



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OVERSEAS—Swiss Federal Railway network now all-electric . . . Rhodesia to discuss finance plans for Kariba second stage . . . Further US-Canada talks on Columbia development . . . Another tunnel completed in Snowy Mountains scheme . . . Kashmir plans two steam power stations . . . American Niagara h.e. station nearing completion. (974, 975)

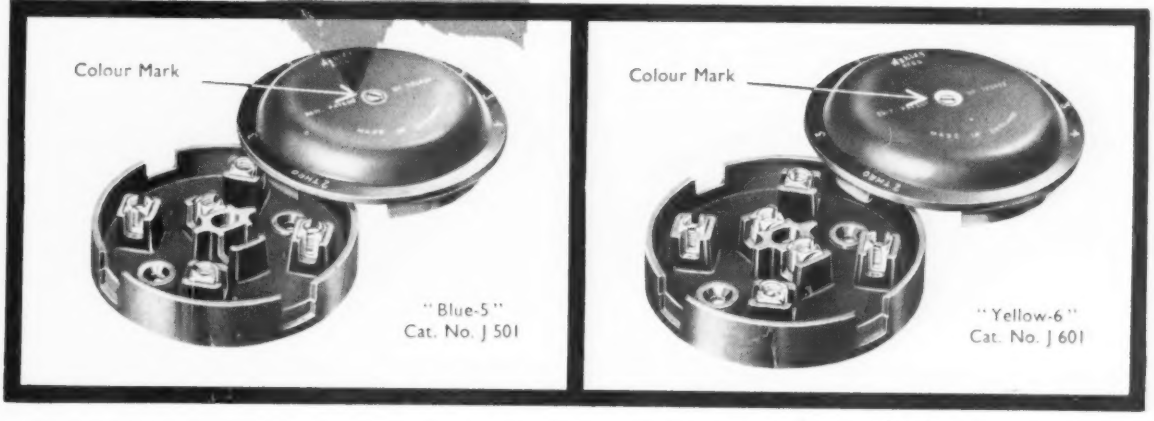
IN SEARCH OF Perfection

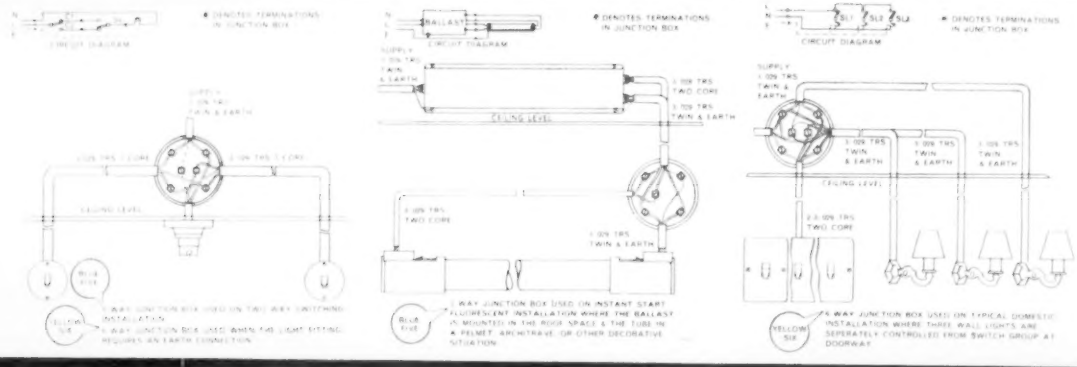
In nature perfection is reflected in infinite detail not apparent to the casual eye.

So too with Ashley Accessories — "there's more than meets the eye".

This means good design and materials, the best equipment, constant inspection and extra effort on the part of everyone.

We think it is worthwhile.





ASHLEY 5 & 6 WAY SELECTIVE ENTRY JUNCTION BOXES

These Junction Boxes have been developed to augment our present range and are designed for use on circuits up to 20 amperes, 250 volts, and the illustrations above depict a number of typical applications.

It is well known that in general lighting and distribution circuits, there is often the need for one or two extra terminals, for example, when looping-in and earthing etc. In the past it has usually been necessary to employ two Junction Boxes side by side, which can be inconvenient and is always uneconomic.

Each of the four combined wiring slot/knock-outs is designed to accept, in brief terms, a range of cables from one 3/.029 twin to two 7/.029 twin and E.T.R.S. or P.V.C.— those not required can be masked by correct location of the selective entry cover.

The Junction Box covers of the 5 and 6-way types are coloured blue and yellow respectively for easy identification.

Dimensions:
Diameter 3½". Height 1 1/32". Fixing Centres 2".

Cat. No.	DESCRIPTION	Doz. List
J 501	"Blue-5" 5 Term. Brown	31/-
J 502	.. .. Cream	34/-
J 601	"Yellow-6" 6 Term. Brown	33/-
J 602	.. .. Cream	36/-

Ashley

ASHLEY ACCESSORIES LIMITED, Ulverston, Lancashire, Eng. Telephone: Ulverston 3333. Telegrams: Ashley Ulverston

C

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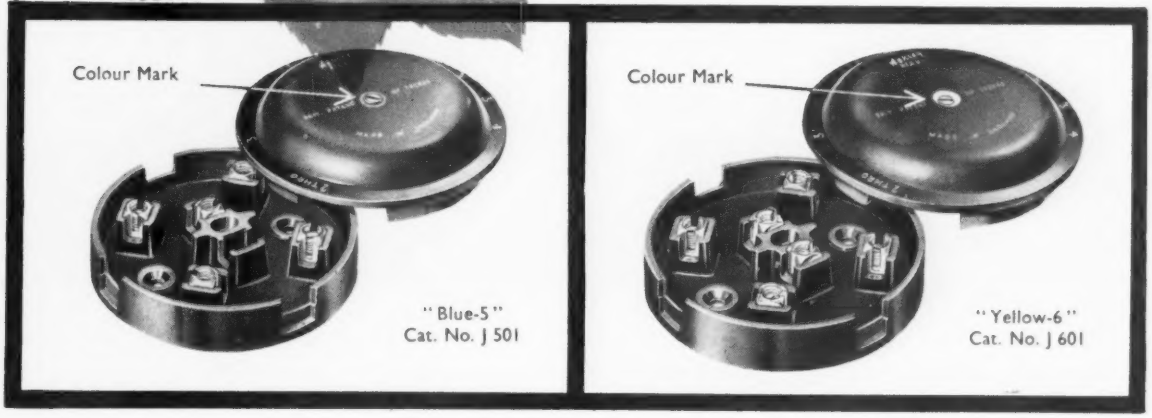

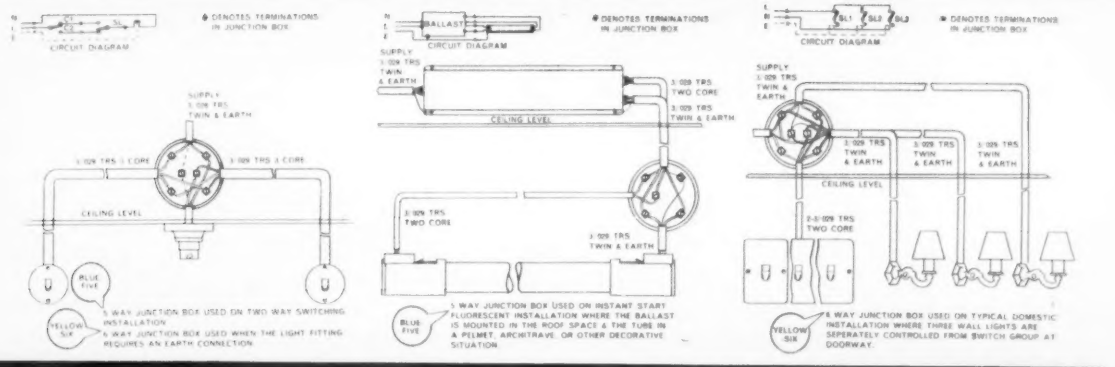
CIRCUIT DIAGRAM
* DENOTES TERMINATIONS IN JUNCTION BOX
SUPPLY
3/.029 TRS TWIN & EARTH
3/.029 TRS 3 CORE
CEILING LEVEL
BLUE FIVE
YELLOW SIX
5 WAY JUNCTION BOX USED ON TWO WAY SWITCHING INSTALLATION
6 WAY JUNCTION BOX USED WHEN THE LIGHT FITTING REQUIRES AN EARTH CONNECTION
BALLAST
3/.029 TRS TWO CORE
3/.029 TRS TWIN & EARTH
5 WAY JUNCTION BOX USED ON INSTANT START FLUORESCENT INSTALLATION WHERE THE BALLAST IS MOUNTED IN THE ROOF SPACE & THE TUBE IN A PELMET, ARCHITRAVE, OR OTHER DECORATIVE SITUATION
SL1
SL2
SL3
6 WAY JUNCTION BOX USED ON TYPICAL DOMESTIC INSTALLATION WHERE THREE WALL LIGHTS ARE SEPERATELY CONTROLLED FROM SWITCH GROUP AT DOORWAY

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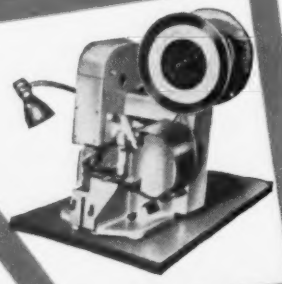
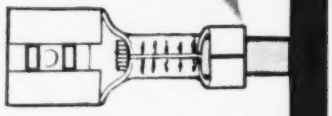
A·E·I–HOTPOINT

use *AMP solderless wiring devices



the means . . .

Application of *Faston terminals to refrigerator harness



*Faston Terminal

The Hotpoint E.37 Iced Diamond (3.7 cu. ft.) Refrigerator.

(Photograph by courtesy of A.E.I.—Hotpoint Ltd.)

. . . to the end

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▲ M·O·S AND A·R·B APPROVED
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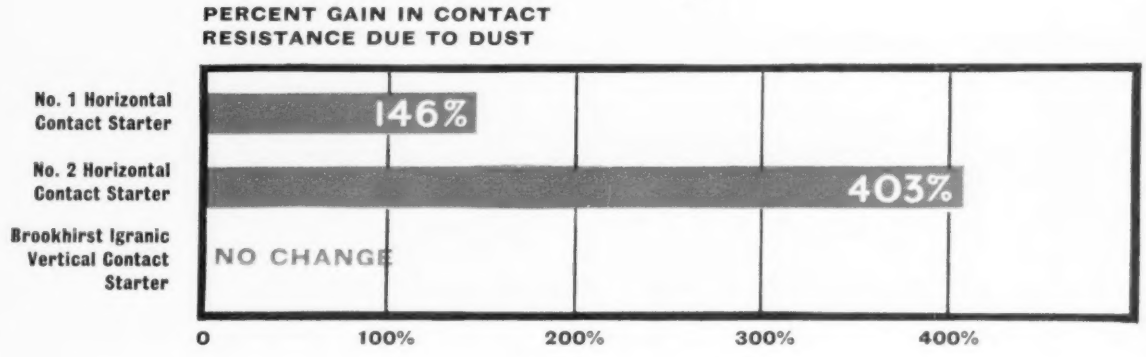
AP128

By design...
By test...
Vertical Contacts are
Dust Proof



A Brookhirst Igranic motor starter with vertical contacts was tested in a standard dust chamber along with two starters with horizontal contacts.

The Brookhirst Igranic vertical contact starter alone showed no increase in contact resistance due to dust deposits, because dust cannot collect on vertical surfaces. Increased contact resistance through dust leads to heating, pitting, wear, and failure.

Vertical DUST-SAFE contacts are Brookhirst Igranic standard.

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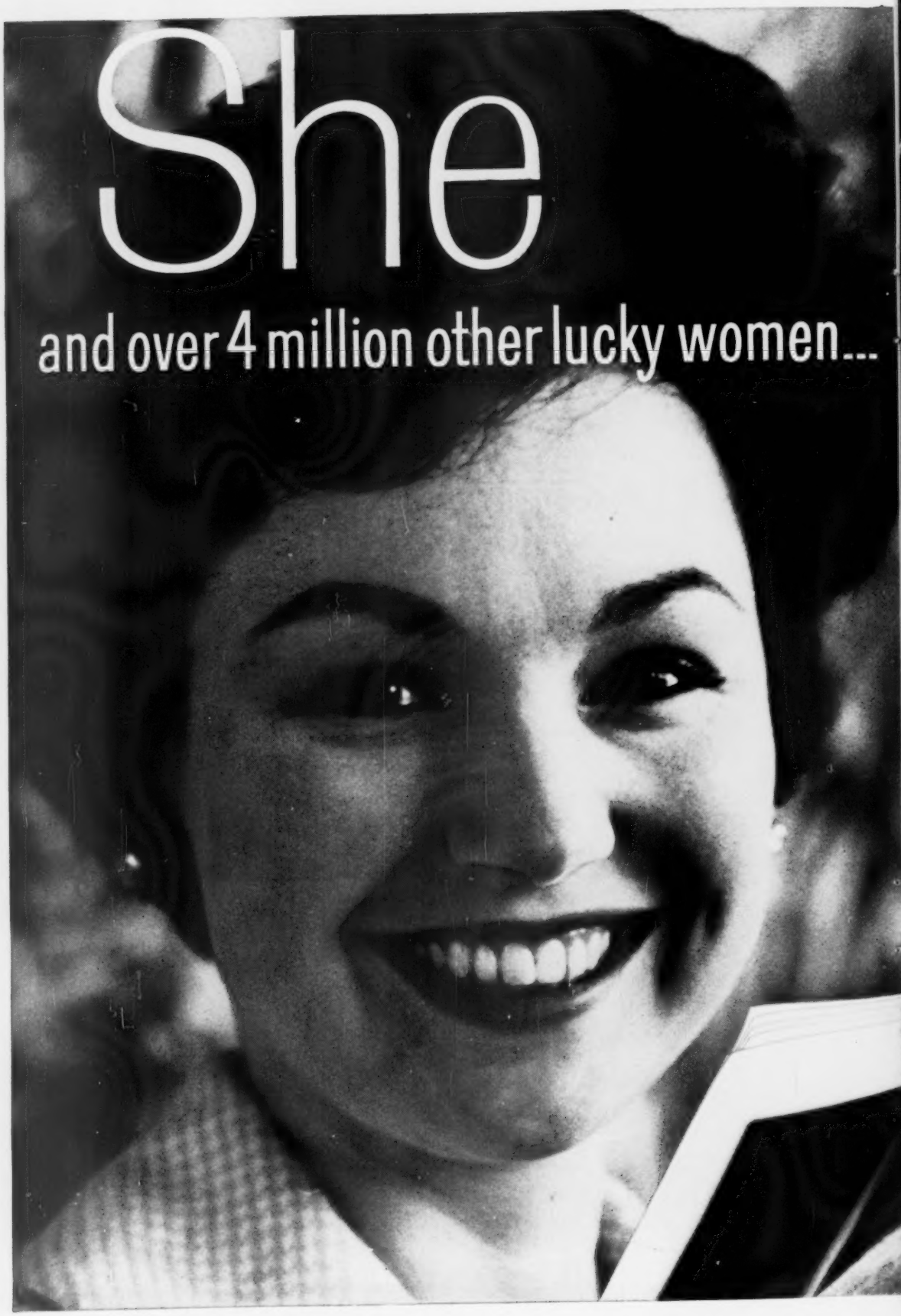
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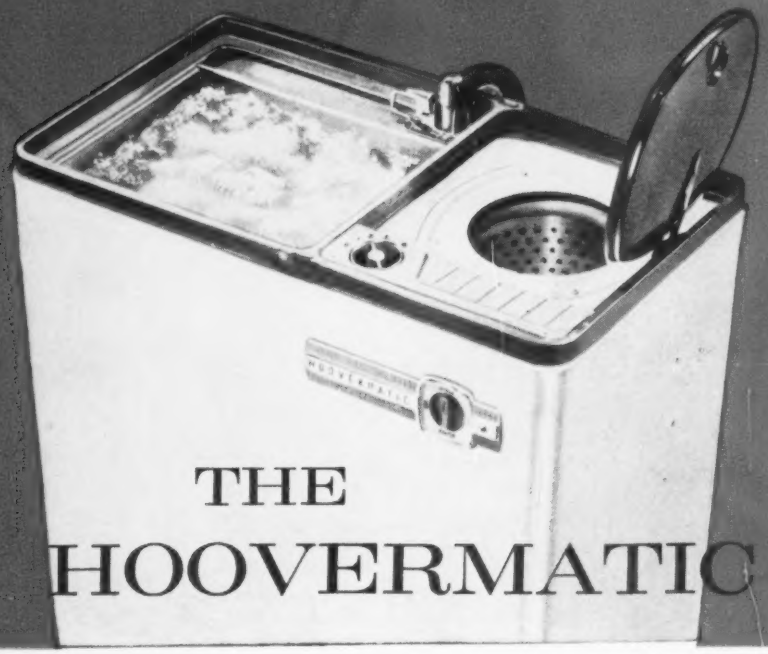
and over 4 million other lucky women...

have forgotten washday drudgery

Yes, 4 million women own Hoover washing machines—women who now enjoy the benefits of modern, quick, efficient washing. And there are thousands more joining them every day.
Hoover are leaders in the electrical appliance field producing what housewives *really* want. Hoover has the largest, best trained Sales Force selling for you direct to your customers. Hoover back your sales with powerful, year-round National Advertising and vigorous Promotional activity.
No other manufacturer PRE-SELLS for you, Mr. Dealer, on the same scale as Hoover.

DISPLAY, DEMONSTRATE and you'll SELL



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Hoover Limited are proud to have been appointed exclusive suppliers of Electric Washing Machines, Cleaners, Polishers and Steam-or-Dry Irons to the Olympic Village, Rome, 1960.

'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.

(Pleasures of Hope by Thomas Campbell)

By courtesy of Tourist Information Centre, Belfast

Irish cables are manufactured amidst scenery depicted above, showing the famous and beautiful Mourne Mountains.

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Here is the Squirrel Cage Motor with staying power, built for a lifetime of service. It is immediately available from stock in outputs up to 25h.p. Standard dimensions to B.S.2083 (1956). Full details are given in Technical Description No. 431.

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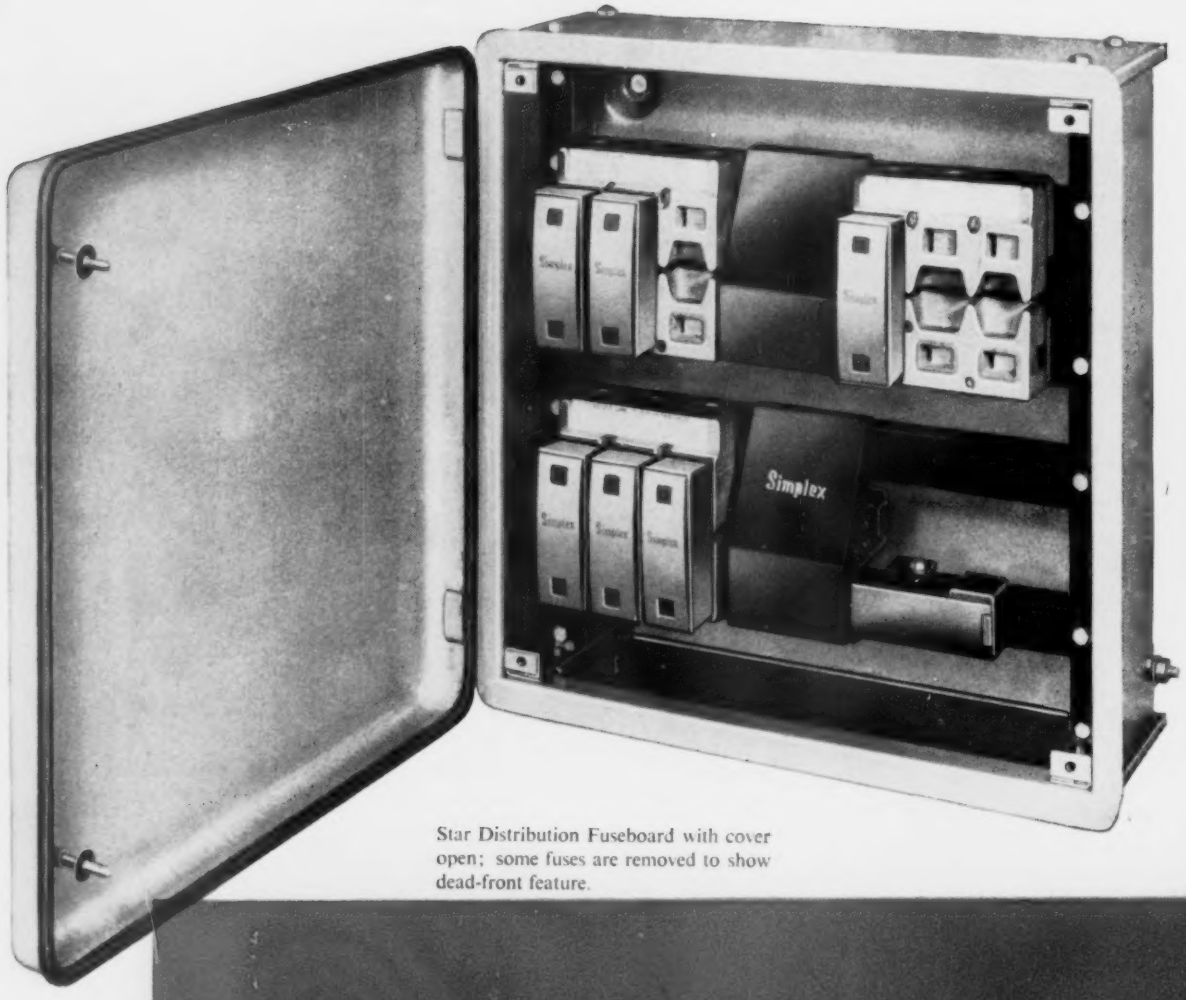
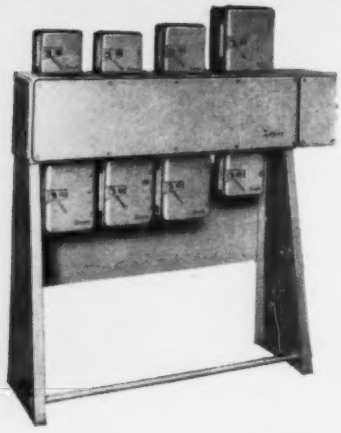


Star Distribution Fuseboard with cover open; some fuses are removed to show dead-front feature.

Simplex

S.2



Star Switchboard — a team of Simplex practical experts will help you with designing, building and advice on complete Simplex switchboard installations. Also available with Simplex S & S automatic control gear, fused switches, isolators, etc.

SIMPLEX ELECTRIC COMPANY LIMITED

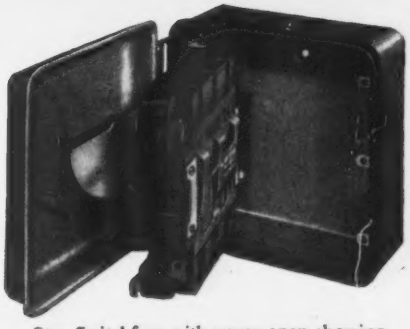
CREDA WORKS, BLYTHE BRIDGE · Nr. STOKE-ON-TRENT STAFFS.

A (T) COMPANY

Branches throughout Gt. Britain and agents throughout the world.

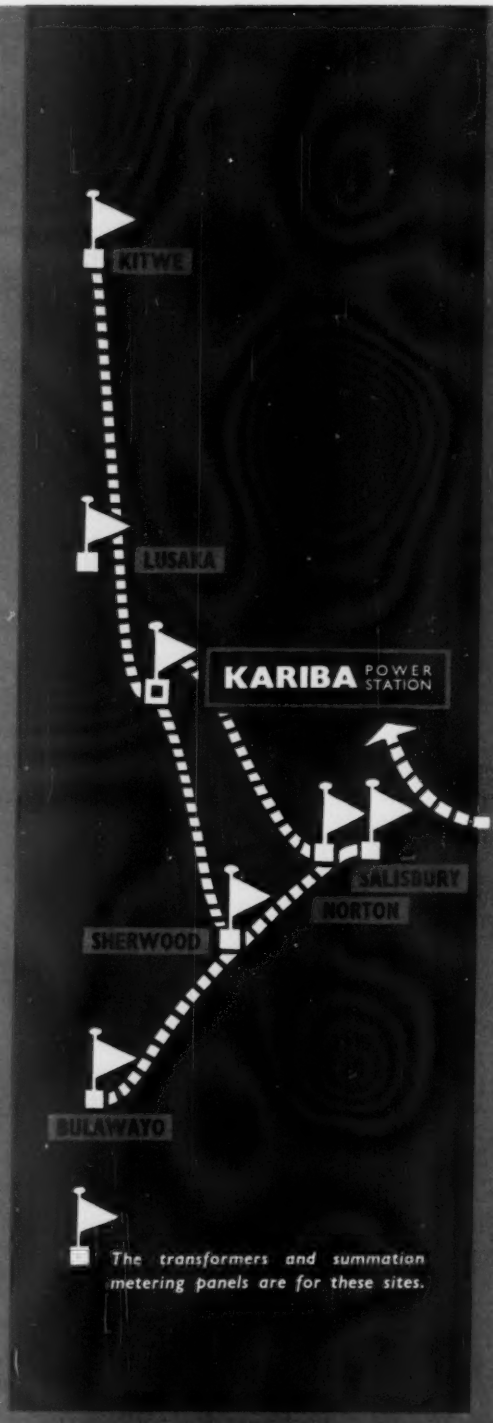
Simplex Star "dead-front" Distribution Fuseboards are low in price, easy to wire, and completely safe—because all live parts are shrouded, even with the fuses removed. There is provision for circuit identification on the fuse bank and neutral connections, for surface or flush mounting, and they are available in 15, 30 or 60 amp fuse ratings, 500 volt A.C. or 250 volt D.C. Write to your nearest Simplex Branch for your copy of the Simplex Star Catalogue, giving full details of the Star and Star Economy Fuseboards.

Star



Star Switchfuse with cover open showing interior hinged forward for ease of wiring. Range: AC 500 volt, 15, 30, 60 amp. DC 250 volt, 10, 20, 30 amp.

SIMPLEX STAR DISTRIBUTION BOARDS
FROM THE BRILLIANT NEW RANGE OF
DEAD-FRONT SWITCHGEAR WITH
EVERYTHING PLUS BUT THE PRICE



The transformers and summation metering panels are for these sites.

TRANSFORMERS

All the sub-station transformers for the Kariba Hydro-Electric Scheme are being supplied by Ferranti Ltd. They comprise two 120,000 kVA, 330/234 kV 3-phase auto transformers with series boosters, eight 60,000 kVA, 330/88 kV and four 60,000 kVA, 330/33 kV 3-phase double wound transformers. The transformer installations at Norton, Lusaka and Kitwe are complete. Work at Salisbury, Bulwayo and Sherwood is well advanced.

SUMMATION METERING

For the same scheme Ferranti Ltd. are supplying Summation Metering Equipment comprising: Precision grade integrating meters, Electro-mechanical summators, Printometer Demand Recorders and Suites of metering cubicles. These equipments will be used to meter six 100 MW generator sets at Kariba Power Station and also the supplies to the Transforming Stations at Kitwe, Norton, Salisbury, Lusaka, Sherwood and Bulawayo.

The consulting electrical and mechanical engineers are Messrs. Merz & McLellan.

Ferranti

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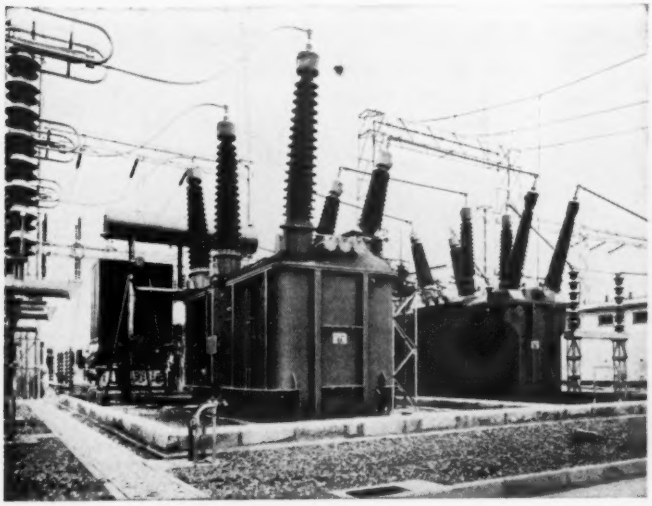
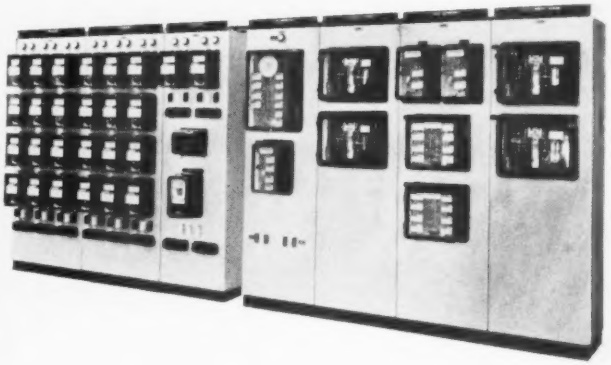


One of the two Ferranti 120,000 kVA 330/234 kV auto transformer and series booster installations at the Kitwe sub-station.

FERRANTI AT KARIBA

Ferranti Summation Metering Panels for the Kariba Power Station.



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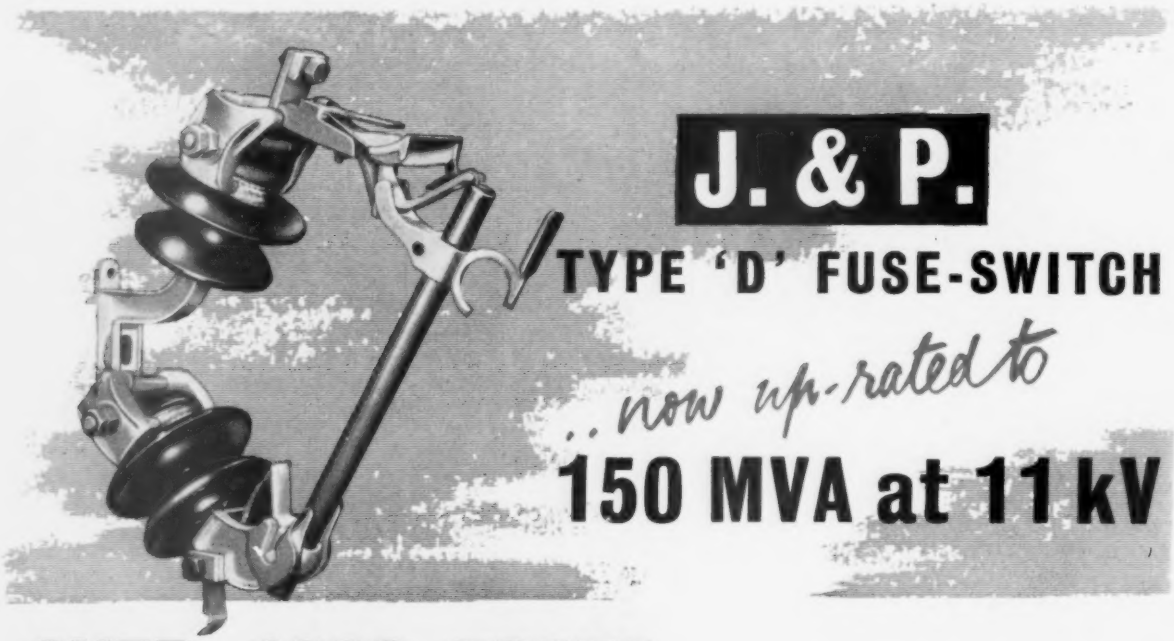

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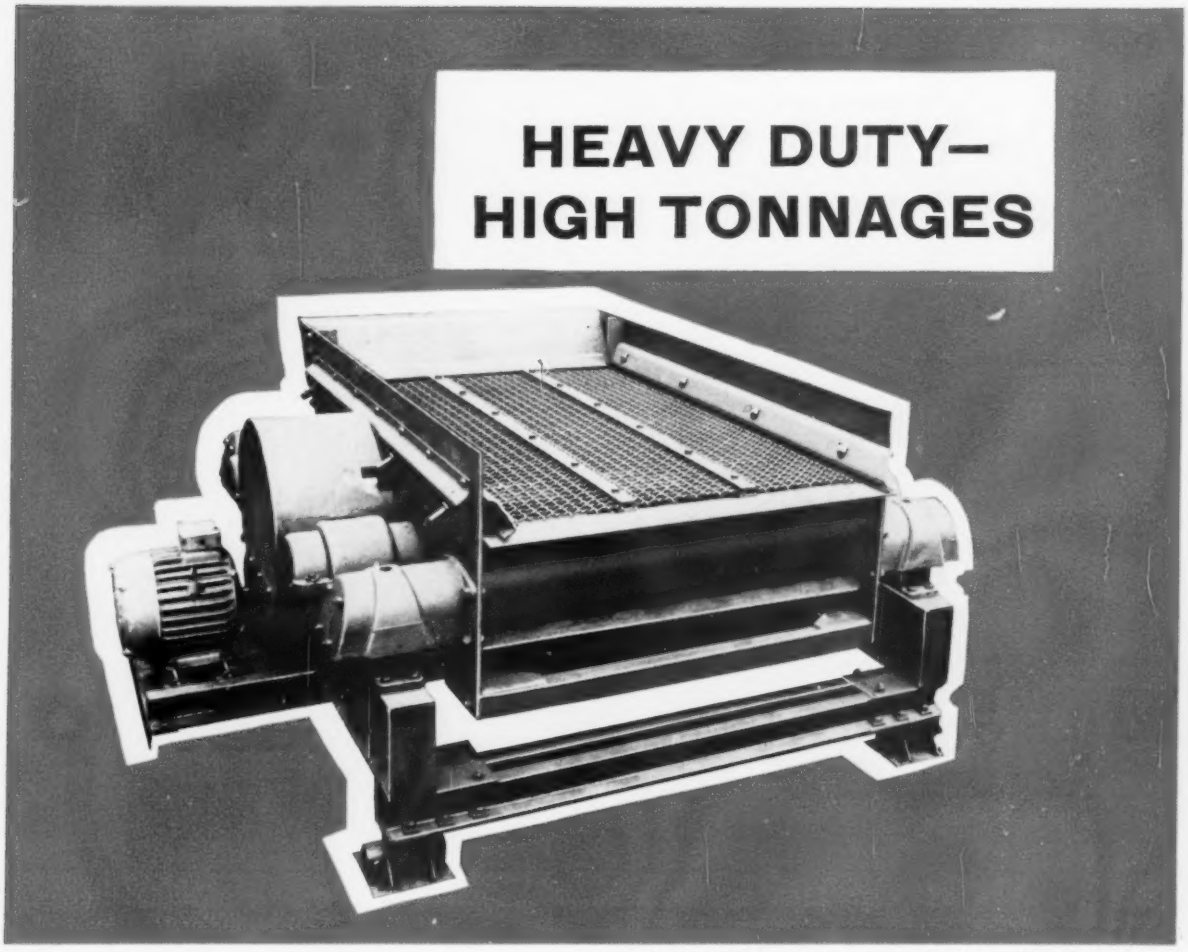

A 4' x 6' type F300 Ty-rock screen for handling coal at a Power Station.

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The Ty-rock full floating screen can be installed for coarse and medium sized screening, up to 10" opening, of coal and other materials.

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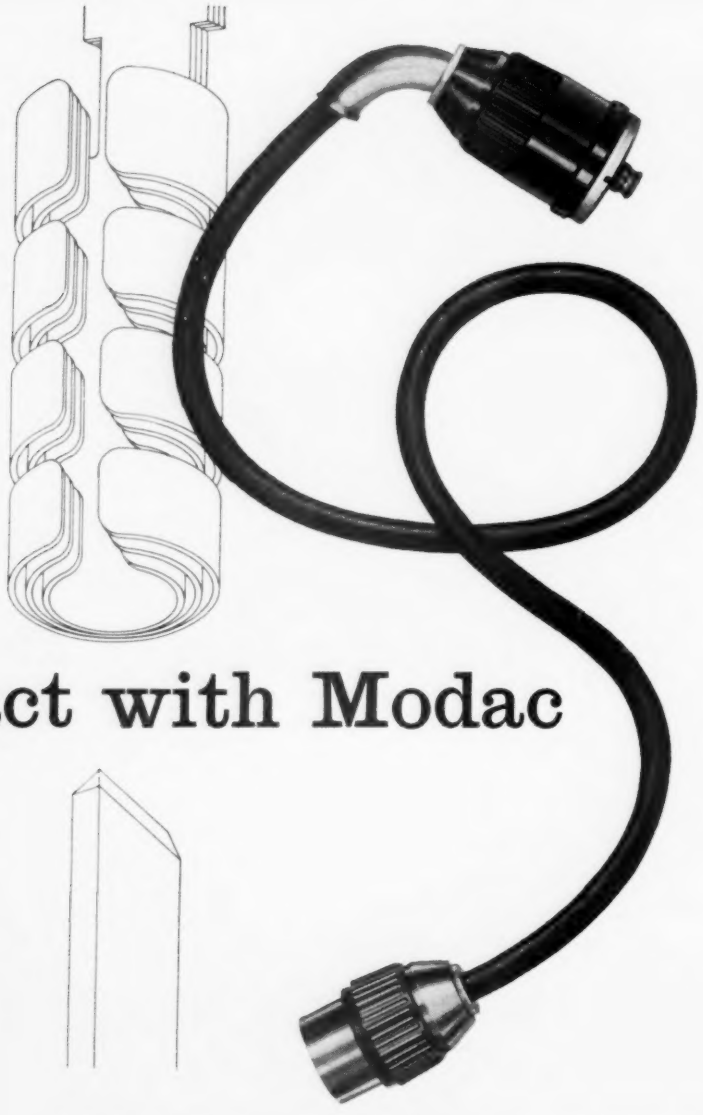
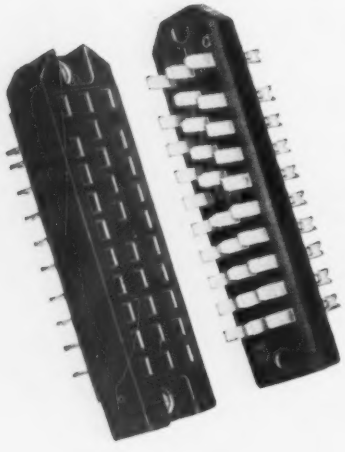


Make contact with Modac



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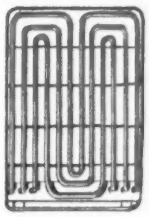
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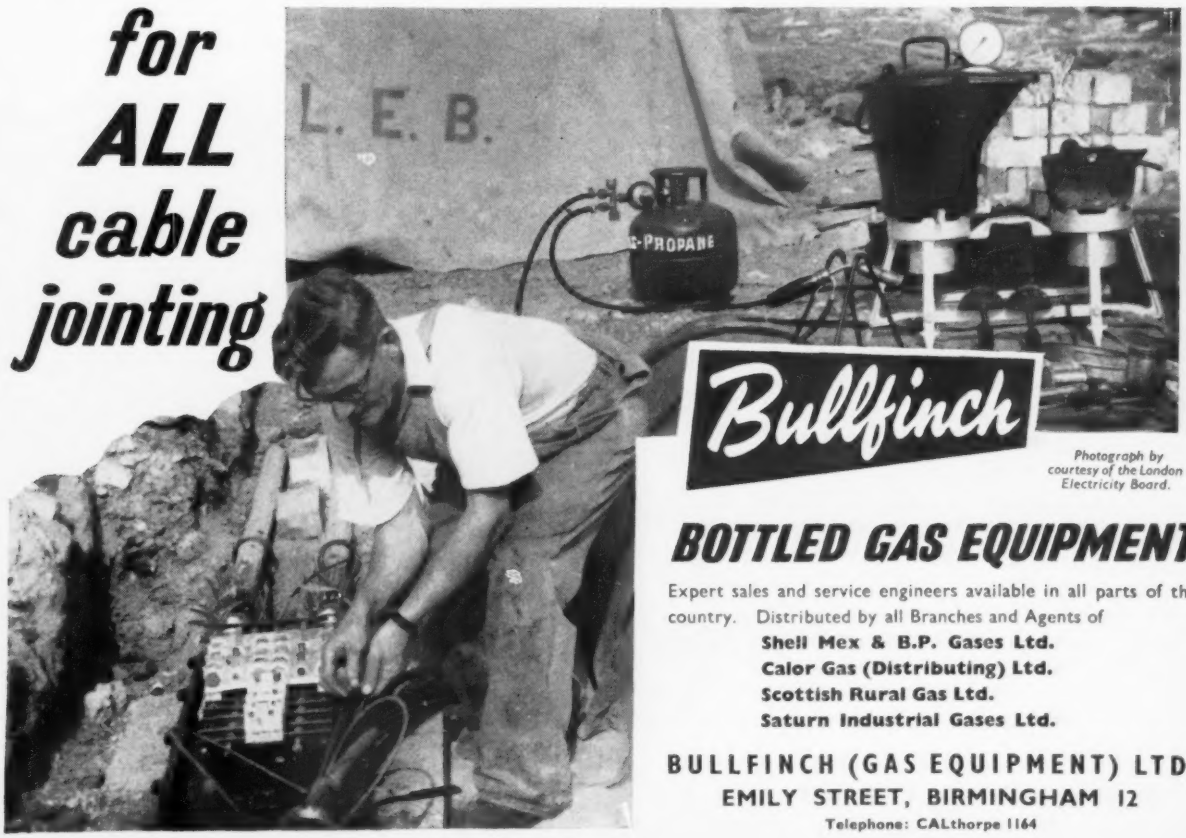

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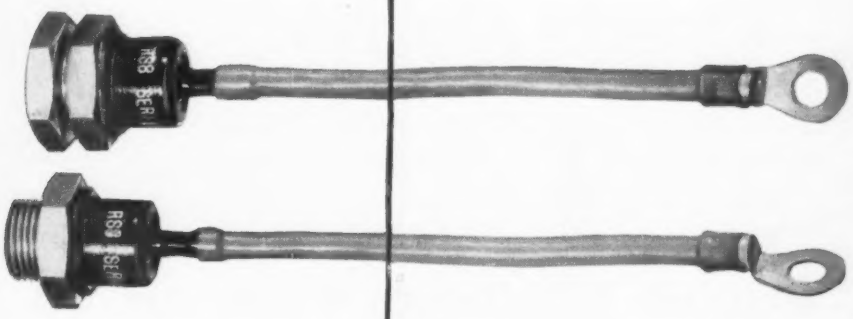

SenTerCel series RS.8 High Power Silicon Diodes incorporate an alloyed junction in a stud-ended, hermetically-sealed case. These devices are of rugged construction and are intended for use with a heat sink.

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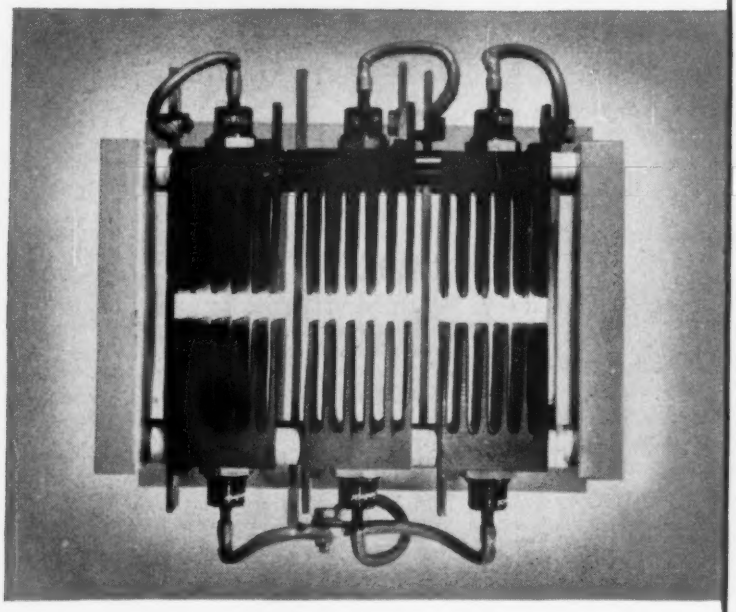

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Maximum current (half wave resistive load) at maximum rated stud temperature	100 amperes mean DC
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Maximum mean dissipation (with suitable heat sink)	150 watts

CHARACTERISTICS OF SINGLE DIODES

Maximum forward voltage at 100 amperes at maximum rated stud temperature	1.2 volts
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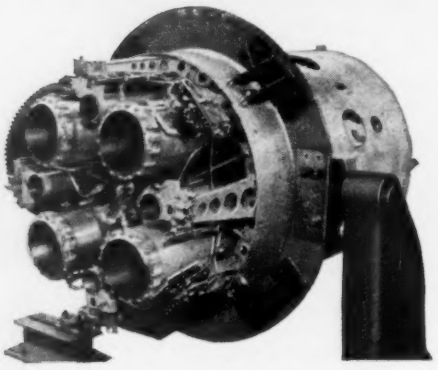
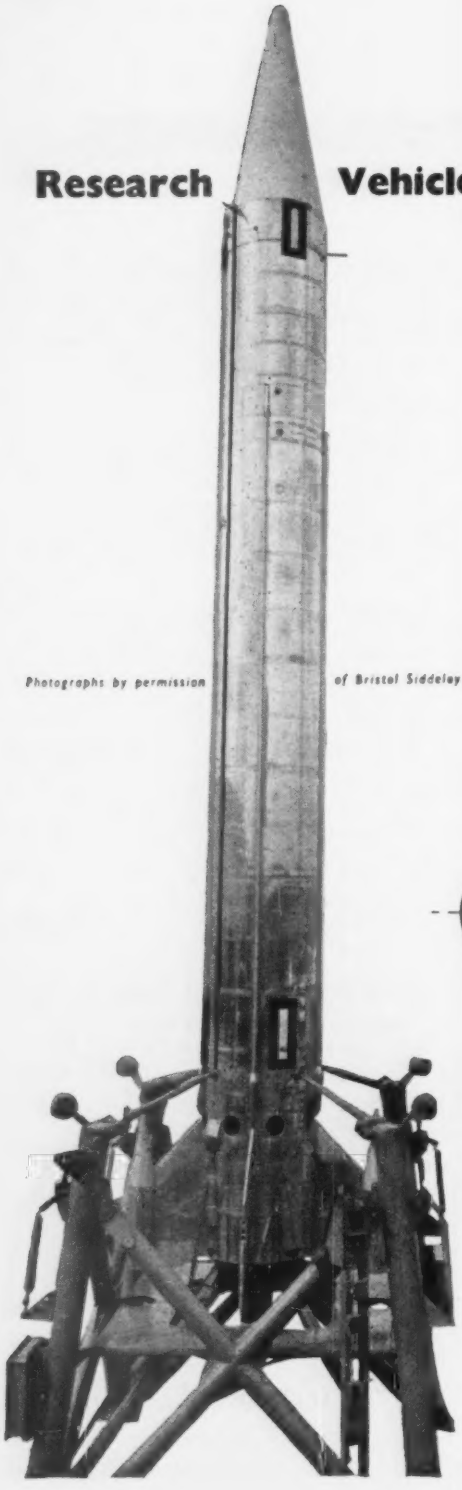


Research Vehicle engines use the Belleville Washer



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When the Black Knight Rocket roars 150 miles up into space it is guided by the swivelling through an angle of the four combustion chambers of the Gamma engine. An efficient damping mechanism is needed to prevent damage when the limit stop is reached.

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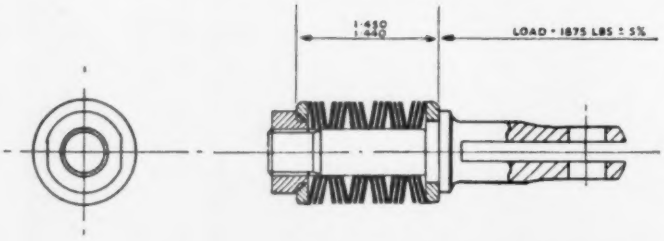

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
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Dans ce numéro

Refroidissement des câbles par Circulation d'Eau ... 957
On a installé deux circuits d'essai pour vérifier l'efficacité du refroidissement par circulation d'eau dans l'accroissement de la capacité limite des câbles de transport. Ces câbles à huile sont des conducteurs à une âme de 6,54 sq. in., conçus pour 132 kV. Dans un circuit, des canalisations d'eau extérieures sont placées près des câbles et disposés selon un dessin trilobé. Dans l'autre, le câble est équipé de tubes en p.v.c. à section segmentaire, placés au dessus des rubans de renforcement et en dessous des couches extérieures de protection. Dans ce second cas, un débit d'eau de 22,7 litres/minute double la capacité limite, la faisant passer de 750 amp à 1500 amp.

Chaudière à Pression Surcritique 961
On a installé dans une aciérie britannique une chaudière Benson fonctionnant à 232 kg/cm² (au dessus de la pression critique). Elle fournit 108 tonnes/heure de vapeur, à 571°C, à un turbo-alternateur à cylindre unique, d'où la vapeur sort à 45,7 kg/cm² à 354°C, pour passer dans une canalisation de vapeur existante pour être utilisée comme vapeur résiduaire. La turbine est contrôlée pour maintenir constante la pression inverse.

Economie de l'Energie Nucléaire 964
Les meilleurs ingenieurs de l'industrie de la distribution de l'électricité en Grande-Bretagne étudient dans une communication présentée à la Conférence Mondiale de l'Energie, les tendances affectant le prix de revient de la géneration de l'électricité. Ils arrivant à la conclusion que le prix de revient de l'électricité par kWh sera le même dans les centrales classiques utilisant le charbon, que dans le type de centrale nucléaire refroidi au gaz, modéré au graphite, qui doit entrer en service en Grand-Bretagne en 1970, à condition qu'il fonctionne avec un facteur de charge de 60%.

In dieser Nummer

Wassergekühlte Starkstromkabeln 957
Zwei Versuchsschleifen sind angelegt worden um die Wirksamkeit der Wasserkühlung zur Erhöhung der Belastbarkeit von Starkstromkabeln zu untersuchen. Die in Frage stehende Kabeln sind für 132 kV ausgelegte, ölgefüllte, einseelige Leiter mit einer Querschnittsfläche von ca. 42 cm². Bei dem einen Versuchskreis sind Wasserrohre in kleeblattförmiger Anordnung aussen am Kabel gelegt, während beim anderen das Kabel mit 24 im Querschnitt segmentförmigen Schläuchen aus PeCe-Kunststoff umgeben ist, die zwischen den Verstärkungsbändern und der äusseren Umhüllung eingelegt sind. Die Prüfergebnisse zeigten, dass im Falle des 2. Kabels eine Wasserdurchflussmenge von 22,7 Liter in der Minute eine Erhöhung der Belastbarkeit des Kabels um das zweifache, nämlich von 750 A auf 1 500 A mit sich brachte.

Dampfkessel für überkritischen Betriebsdruck ... 961
Ein in einem britischen Stahlwerk aufgestellte BENSON-Kessel weist einen über den kritischen Druck hinausgehenden Betriebsdruck von 232 kg/cm² auf. Er liefert 108 T. Dampf pro Stunde bei 571° C u. zw. zur Beaufschlagung eines einstufigen 9,5 MW-Turboalternators, von dem aus der Abdampf mit einem Druck von 45,7 kg/cm² bei 354° C direkt in eine bestehende Nutzdampfleitung eingeleitet wird. Die Turbine untersteht einer automatischen Regelung, damit der Gegendruck konstant bleibt.

Die Wirtschaftlichkeit mit Kernkraftwerke 964
In einer der Weltkraftkonferenz vorgelegten Abhandlung besprechen leitende Fachingenieure der britischen Stromversorgungsindustrie die bestehenden Tendenzen in der Kostenberechnung der Stromerzeugung. Daraus wird geschlossen, dass die Stromerzeugungskosten pro kWSt der in Grossbritannien herkömmlichen Kraftwerke mit Kohlenfeuerung denen der zur Inbetriebsetzung 1970 vorgesehenen britischen gasgekühlten, mit Graphit moderierten nuklearen Kraftwerke ungefähr gleichen, unter der Voraussetzung, dass diese mit einem 60%-igen Belastungsfaktor betrieben werden.

Water Cooling of Power Cables 957
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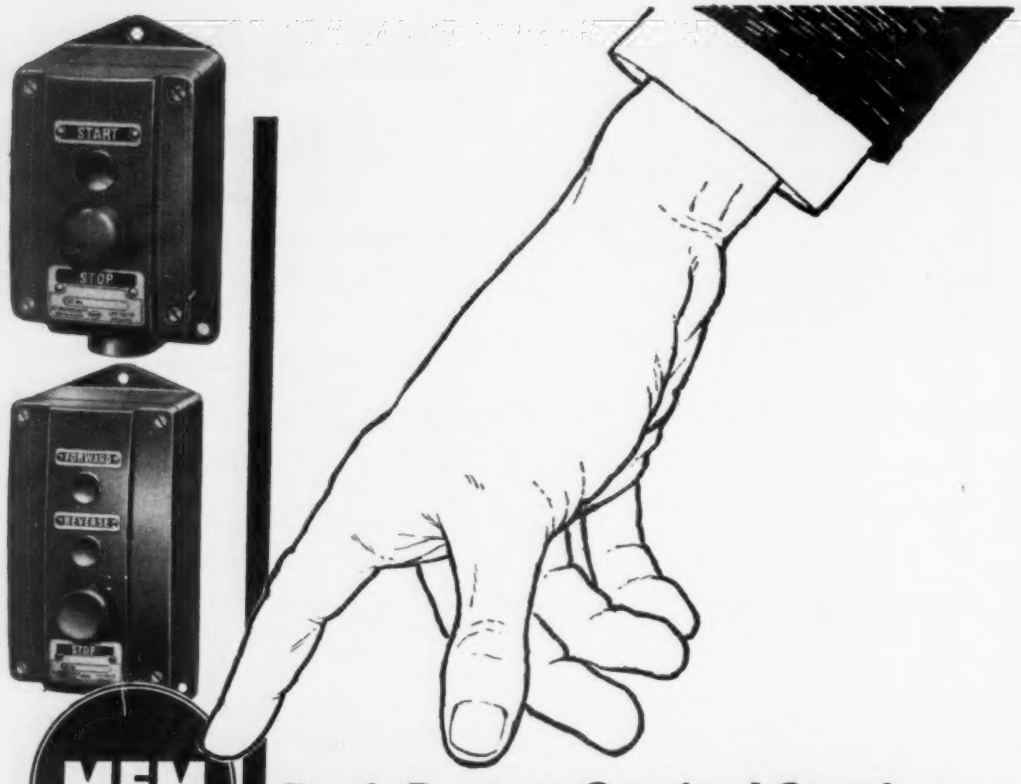

Watertight pattern surface mounting 2 CSU/W "Start"—"Stop"

Watertight pattern surface mounting 3 CSU/W "Forward"—"Reverse"—"Stop"

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Surface mounting enclosed pattern 1 CSU "Stop" only

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Watertight pattern surface mounting 33 CSU/W "Start"—"Inch"—"Stop"

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 16 JUNE, 1960

Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

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T. W. WRIGHT

Comment

INDUSTRY'S VIEW OF THE FUTURE

The statistics of an inquiry into industrial trends which the Federation of British Industries released last week put a reasonably agreeable tinge to the immediate business future but suggest some storm clouds on the horizon in shortage of labour and a consequent trend to higher selling prices. Currently, the trend to higher prices is marginal, and so far as the electrical industry is concerned it may not be altogether unhealthy; but the way in which output is being restricted by lack of workers rather than by lack of orders or equipment is unwelcome from most aspects. Part of the answer to such a situation lies in more mechanisation and it is significant that the FBI survey shows higher investment programmes likely to be authorised by boards of directors in the next twelve months, with the accent on new plant rather than on new buildings. This is good news for electrical manufacturers and is confirmed by the continued upward rise in the value of orders for capital equipment received during the four-month period covered by the survey—although this may not apply everywhere among the heaviest sections of engineering. Overall, the impression the survey gives is that prospects are not unfavourable provided there is a sustained effort towards increased productivity and provided the pressure towards increased prices is not overwhelming. A key question not asked in the inquiry to some 700 firms on which the survey is based is the trend in export selling. That must have a major effect on governmental steps to adjust the financial background to manufacturing and could suddenly alter the whole picture.

OPTIMISM ON NUCLEAR COSTS

On the basis of plant annual load factors of 75%, nuclear power stations commissioned in 1967 should give electricity at an average cost of 0·53d/kWh, the same as for coal-fired stations commissioned in that year. If 60% annual load factor is assumed, then 1970 is the break-even year and 0·55d/kWh the price. That important conclusion is based on a complex process of estimating which Sir Christopher Hinton, Mr F. H. S. Brown and Mr L. Rotherham explain in a paper presented to last week's Madrid meeting of the World Power Conference. It is a better outlook for nuclear power than some have admitted in the past year or so and it includes a margin for manufacturers' development costs. If coal prices increase, as they may well do under renewed inflationary pressure despite the authors' prediction otherwise, then the prospect may be better still. The predictions gain in persuasiveness from being based on currently foreseeable developments of the gas-cooled reactor,

although 1970 is likely to see more sophisticated types of reactor, such as the fast breeder, just coming into use for power generation, and it is on these that the hope for a significant decrease in cost below that for coal-fired stations is based. The paper admittedly does not directly discuss the frequently voiced criticism that it might have been better to await progress with one of the more complicated reactor systems before expending so much capital on nuclear stations. Yet if the correctness of choosing the gas-cooled graphite-moderated route is accepted, then there is support for proceeding with building stations even before they are competitive. Indeed, the rate of progress predicted has the essential pre-requisite that there should be at least one new nuclear station built a year, because of the contribution to progress made through knowledge gained from detailed design and site operations. This is a powerful argument in favour of the course taken by the CEGB, backed up as it is in hard cash terms by the striking reductions in capital cost which now seem likely to be achieved for the Dungeness and Sizewell stations. From the WPC papers on the British nuclear programme as a whole, the feeling is strong that nuclear prospects are better than they seemed.

BOILER VARIATIONS

Before the war there was a continuous flurry of attention to special types of boiler, mainly in the forced circulation class. Since 1945, the rapid increase in unit size for power station boilers has secured concentration on designs in the main stream of evolution, although the sheer increase in size and pressure is leading to some degree of assistance for circulation in the latest designs. But the installation of the 240 klb/hr Benson boiler by the Steel Company of Wales makes a nostalgic exception; and it imports an added technical interest through its operation at 3,300 lb/sq in. in the supercritical pressure zone, so long discussed but still not applied in British power stations. Since the boiler supplies a topping set, exhausting to an existing process steam main at 650 lb/sq in., the question of needing steam temperatures at t.s.v. higher than the metallurgically economical 1,050°F does not arise as a major factor in deciding whether use of the supercritical pressure is worth while. The need to go to extensive use of expensive austenitic alloys if maximum effectiveness is to be obtained from supercritical pressures in a condensing cycle with a large turbine is the outstanding factor that delays this step for major power stations. Nonetheless, experience with the SCoW boiler will be important when the time comes for the supply industry to venture into the highest pressure field, as it has been suggested it may do for one of the projected 350 MW sets for Drakelow "C."

NEXT STEP IN THE SUPERGRID

Orders placed by the CEGB for two 400 MVA auto-transformers to operate at 380 kV herald practical trials at last with this voltage on the supergrid. Ever since the design of this part of the transmission system was begun it has been envisaged that some parts used for bulk transfer of power rather than interchange would be operated at a higher voltage than 275 kV. However, development has proved more troublesome than was anticipated for a voltage which is widely used on the continent of Europe and elsewhere in the world. Extensive experimenting seems to have overcome the worst problems so far as apparatus is concerned; as from 1962 the operation of the 64-mile trial line will test how well the answers arrived at co-ordinate together under practical conditions. It is of major importance that success should be achieved, for the facility of uprating the supergrid without major reconstruction is an important requirement in the continuing fight to keep down supply costs and to restrict the amount of country that has to be traversed by main transmission routes. 380 kV replacing 275 kV increases a 600 MW capacity single circuit to 1,000 MW. But there lies a bigger development task ahead. Sir Christopher Hinton has made clear the need for early progress to a higher transmission voltage, 500 kV or above, to give the still greater circuit capacities that can keep down the number of wayleaves required.

HOW DEEP IS DEEP-FREEZE

Complaints are usually rare when business is booming: the more surprising, therefore, that Mr Saunders, of Kelvinator, should have chosen the present time to launch a tirade against imported refrigerators in general and deep-freeze compartments in particular. Imported models, he states in a letter to the *Financial Times*, are being sold in a manner designed to suggest a British origin, some even boldly carrying the nameplate of a well-known British manufacturer. However, with the flood of foreign electrical appliances now on the market, the "Buy British" tag is somewhat at a discount, especially in this era of thinking Continental. On the question of deep-freeze compartments, Mr Saunders does a service to the industry in drawing public attention to the happy-go-lucky attitude of importers towards this latest feature of refrigerator sales appeal. He underlines what was said some weeks ago at the BRA lunch by the president of the Association of Frozen Food Producers, that insufficient attention is being given by designers to ensure proper temperatures in deep-freeze compartments. Certainly, few manufacturers or distributors state in their specifications the temperatures obtainable in such compartments; probably many have not bothered to find out. Equally, distinction is rarely drawn between compartments designed to quick-freeze fresh foods and those suitable only for storing pre-frozen food packs. With the continuing high level of refrigerator sales, the proper specification for deep-freeze compartments has become a matter of urgency. The onus lies squarely on the shoulders of manufacturers to remedy this before the public becomes actively discontented.

Meteor

This week's quick summary of electrical news faces advertisement page 16.

Water cooling of power cables

TWO TECHNIQUES IN SOUTH WALES TRIALS

by D. A. Thoms, B.Sc.(Eng.), A.M.I.E.E., and W. Holdup, B.Sc.*

THE possibilities of increasing the current-carrying capacity of cables by forced cooling have held the attention of cable engineers for some years. The question is becoming more urgent as the demands for electrical energy increase and cables are being designed to carry heavier loads.

Whilst a number of possibilities have been explored, it is probable that the simplest and most economical method to be applied to a cable buried directly in the ground is that put forward by Nigol and West, of the Hydro-Electric Power Commission of Ontario. In their system, polythene water pipes were laid adjacent to the cables and with quite moderate flows of water, an increase in heat dissipation from the cables sufficient to allow a 50% increase in current-carrying capacity can be expected. The degree of cooling possible with this system is limited by the inevitable temperature difference across the thermal resistance between the heat source (the conductor mainly) and the coolant. More important possibly is the fact that this method cannot be effectively applied to portions of a cable route above ground, at terminations for example. Although the rating would normally be higher at such positions, the forced cooled cable system could be limited by them.

Alternative Systems

A more effective method would be one in which the coolant was in close contact with the cable. Nigol and West investigated the use of water flow in plastics pipes containing power cables and have shown this method to be more efficient.

Possibly the most attractive system at first sight is the circulation of a coolant through the cable. By extracting heat from within the cable the thermal resistance of the cable insulation is avoided and even higher currents would be expected to be carried. The oil-filled cable lends itself to this form of cooling by circulation of oil through the cable oil ducts as investigated by Oudin and Hansson. Because of the low specific heat of oil compared with that of water, however, high velocities are required so that, if the cable is to be kept to a reasonable pressure, the length must be limited or intermediate pumping positions installed.

With this method, too, the coolant forms part of the cable dielectric and great care must be taken with the design of the pumping system and any heat exchanger to ensure that no deleterious matter is allowed to come into contact with the oil. Which system is chosen for any given project will depend on its particular requirements but, in general, external water cooling is likely to be favoured. It provides a means of increasing the current-carrying capacity of cables to an extent that is in most cases adequate (in the order of 100%) without taking liberties with electrically highly stressed dielectrics.

* Mr Holdup is with Pirelli-General Cable Works Ltd. and Mr Thoms with the CEGB.

The opportunity has been taken to install water-cooled cable circuits in this country. Pirelli-General Cable Works Ltd. and the South Wales Division of the CEGB have co-operated in the installation of two such 132 kV circuits transmitting power from Uskmouth Generating Station. Water-cooling was introduced on these particular circuits because the rating of the cables as originally designed, 750 amp, is lower than that of the associated switchgear and overhead line. If, in the future, an increase in current up to 900 amp is required, then the water-cooling will

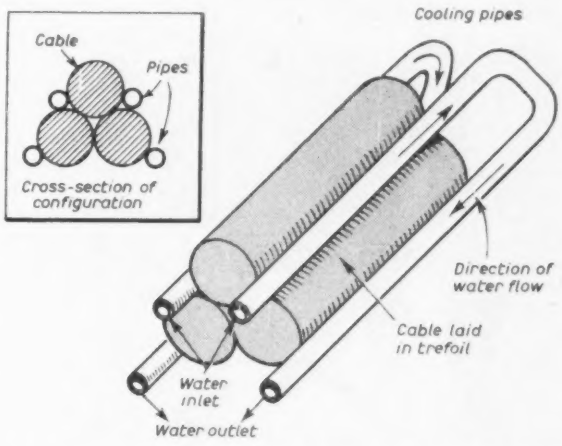

Fig. 1. Arrangement of cooling pipes alongside the three cables in the 180-yard long Gloucester circuit

be more than adequate to cater for the increased load. At the same time, as it was appreciated that these circuits would provide much-needed experimental data on cooled cables in operational conditions, two cooling systems were chosen for comparative purposes. Both circuits are similar in that they consist of 1·0 sq in. single-core 132 kV oil-filled cables laid in trefoil formation between the 132 kV switch-house and an overhead line terminal compound.

Gloucester Circuit

With one circuit, the Gloucester circuit, approximately 180 yd in length, external water pipes have been laid in a manner somewhat similar to that used by the Hydro-Electric Power Commission of Ontario, except that the arrangement has been modified to suit a trefoil formation. Little will be said about this circuit in this article as no experimental results are yet available. It might, however, be an interesting point to note that the cooling water is returned in close proximity with the cables (Fig. 1), and in this way it is hoped that the cooling will be more uniform along the cable length. Looked at simply, at the far end, where the cable would be at its hottest because the coolant is warm, the return pipes provide the maximum

additional cooling whereas, at the near end, where the water enters at ambient temperature, the return pipes provide little, if any, additional cooling.

Ebbw Vale Circuit

The second circuit, the Ebbw Vale circuit, approximately 260 yd in length, has been manufactured with integral cooling channels in the form of 24 segmental-shaped p.v.c. tubes laid over the reinforcement tapes and under the external servings (Fig. 2). This system was chosen to provide cooling along the full length of the cables up to the sealing ends at either end of the route.

Fig. 2. Design of cable for the Uskmouth circuit, showing integral coo'ing channels formed from p.v.c. tubes, laid over reinforcing tapes and under external servings

Fig. 3. Outdoor sealing ends, showing circular cooling pipe manifold

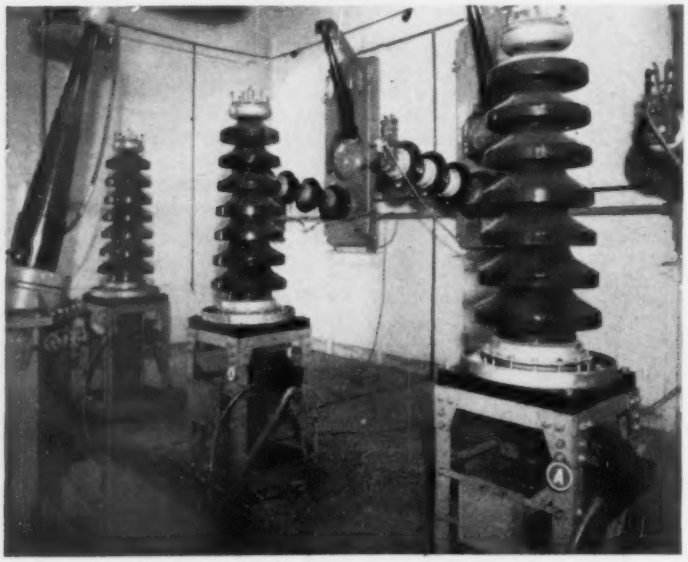

Fig. 4. Switch house terminations for the Ebbw Vale circuit installation, showing rectangular cooling pipe manifolds and outlet tubes

At the overhead line terminal compound, the sealing ends are mounted on 8 ft high steel structures and the cooling tubes are connected to circular manifolds cast in resin just beneath the plumbed wipes of the sealing ends (Fig. 3). Water is led to these manifolds through 1 in. p.v.c. pipes from a hut containing the water supply arrangements for both circuits.

At the switch-house end, outdoor type porcelain sealing ends stand on low steel supports housing current transformers. The cooling tubes are brought through the current transformers and out to a straight manifold of 1 in. p.v.c. pipe again encased in a resin casting (Fig 4). The 1 in. pipe from each phase is connected to a common 1 in. return pipe laid 2 ft apart from the trefoil group in the trench.

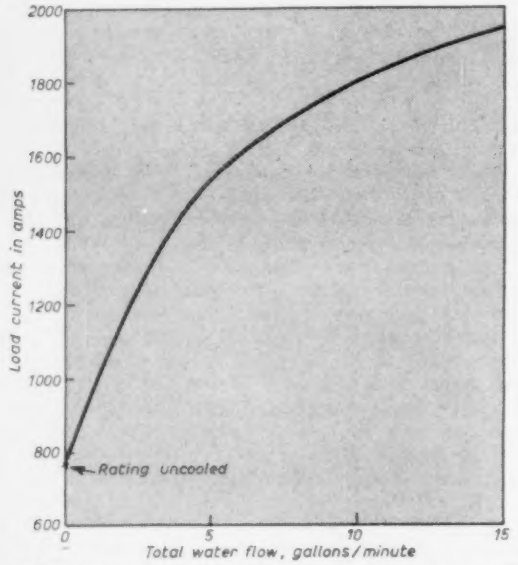

Fig. 5. Permissible current loadings at various rates of water flow

The design of the pipe manifolds is of importance because water leaks at the switch-house could not be tolerated. The individual tubes were let into a blanked-off section of 1 in. bore p.v.c. pipe. Each entry was sealed with a p.v.c. paste and the whole placed in a mould into which a polyester was poured. On setting, the resin provided a tough reinforcement and sufficient heat was generated during the exothermic setting reaction to solidify the paste and permanently seal the tube entries.

Town main water is fed to a 50 gallon tank via a conventional ball valve, whence it is taken to a centrifugal pump and fine mesh strainer. A constant-pressure reducing valve ensures constant flow. A "Rotameter" is used to indicate the flow to the channels on each phase, with means provided for equalisation of the flows. The return pipe is also connected via a "Rotameter" to the 50 gallon tank.

Thermometers have been added to register the temperature of the water at the cable inlet and outlet and also at the outlet point of the return pipe. From these temperatures and the cable oil pressures, the cable temperature can be assessed and measurements taken of the

degree of cooling achieved. The circuit is shown schematically in Fig. 6.

Normal load currents on these circuits are at present too small to effect reasonable temperature rises so, for testing purposes, artificial loading is adopted with the cables out of service and disconnected from the system.

Two 11 kV/400 V 3-phase 500 kVA distribution type transformers are connected in parallel and energised at 3·3 kV to give about 70 V to earth from the secondary terminals. The three cables of a circuit are connected to form a three-phase Y, the neutral point at the far end of the circuit being formed through three air-cooled reactors which can be varied to give a measure of current control.

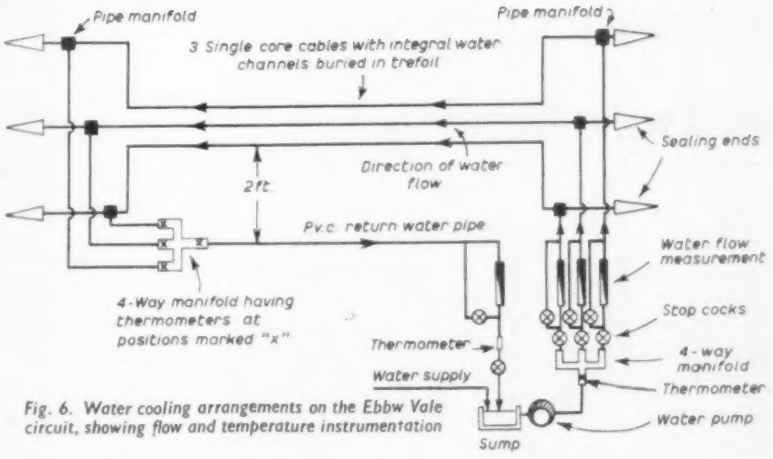

Fig. 6. Water cooling arrangements on the Ebbw Vale circuit, showing flow and temperature instrumentation

The existing current transformers are used for local loading current indication. It has not been possible to carry out a full-scale test on the separate cooling pipe circuit, but runs with different rates of water flow have been made on the second circuit.

Effectiveness of Cooling

In this second circuit the cables are cooled by the water flow through the segmental tubes. The water is then cooled in turn during its passage back through the return pipe, which is placed apart from the cables. This cooling, plus the natural cooling from the 50 gallon storage tank, appears to be adequate to maintain the inlet water temperature at a sufficiently low value to cater for increases in current up to 50% above normal load. Above this figure the inlet temperature would have to be kept down to a low value by either running the water to waste or by including a heat exchanger to cool the return flow. Assuming that the inlet temperature is maintained at a value not exceeding 20°C, the permissible currents expected for various rates of water flow are given in Fig. 5. It can be seen that, with a flow of five gallons per minute, for example, the current-carrying capacity could be doubled from 750 amp to 1,500 amp.

With increases of this order, the economies bear looking into. Apart from the occasional demand for a cable, the conductor section of which, if uncooled, would be too large to manufacture and handle reasonably, other applications are possible. Such examples are cases where it is difficult to forecast future demand or, as at Uskmouth, where it is desirable to match the capacity of associated equipment in anticipation of future increased demand.

Another possible use would be where twin feeders are required, the conductor cross-sections of which are designed to enable both cable loads to be taken by one in the case of an outage on the other. In this case the cables could be designed each to carry their normal load with cooling added to cater for the occasional double load on one cable.

The Uskmouth installation is expected to give further useful information on the economics of water-cooling.

TRANSMISSION TRIALS AT 380 kV

TRIALS with 380 kV as a transmission voltage for the supergrid are foreshadowed in an order the CEGB have placed with the English Electric Co. for a 275/380 kV auto-transformer to be delivered in 1962. Rated at 400 MVA, the transformer is to be installed at the High Marnham end of the 64-mile long transmission line from High Marnham, Notts, to Monk Fryston, near Leeds. Ferranti Ltd. have received an order for the transformer for the other end of the line. Value of each order is about £250,000.

The possibility of using 380 kV as the voltage for part of the supergrid has been kept in mind since the first designs were prepared and most of the existing 275 kV lines have been built with clearances sufficient to permit operation at 380 kV. The higher voltage has advantages where the lines are being used for bulk transmission of power rather than as interconnectors, for a single circuit operating at 380 kV can handle about 1,000 MW, compared with 600 MW with operation at 275 kV.

Although 380 kV is in common use abroad—in France, Sweden and Germany, for instance, to consider Europe alone—there are a number of technical problems to be solved before it can be used with confidence in this country. These problems are largely related to the effect of atmospheric pollution and salt spray on the insulators for the lines and the terminal equipment. Investigations have been in hand by the Central Electricity Research Laboratories since 1955 and the last CEGB report noted that 380 kV insulators from three manufacturers had been successfully type-tested. Preliminary designs for 380 kV substations were reported to be in hand.

Another problem about 380 kV operation concerns lightning performance, for in recent years there has grown some doubt about the way lines for voltages above 300 kV behave to lightning-induced surges.

The English Electric transformer will weigh 420 tons when filled with the 47,500 gallons of oil it will need. It will be a three-phase design with pumped oil cooling, fan-assisted. For transport purposes the weight will be kept to 172 tons and the size to 35 ft by 16 ft by 16 ft high; this will increase to 58 ft by 27 ft by 32 ft high when assembled on site.

Lighting in an affluent society

by J. Boud, B.A.

IF we survive the twin hazards of annihilation and over-population we are likely to get richer. Technological advance should mean greater productivity. It should also mean shorter hours, higher pay, cleaner work; fewer people will be engaged in production and more and more in promotion, public relations and persuasion. We can expect that more money will be available for what were once considered unessentials. More energy, time and seriousness will be lavished on prestige, display and conspicuous consumption, on proving how successful is an individual, an organisation, or a society—by extravagance. All this can have a profound effect on the lighting market provided we understand its implications.

Think for a moment about extravagance. It is the basis of all fashion. A man wearing a white shirt accepts a convention but there is a reason for its existence: a white shirt is inefficient, it gets dirty quickly, it is completely unsuitable for manual work and, even without it, frequent washing will be necessary. Therefore the man in the white shirt proclaims two things: "I don't work with my hands; I can afford a clean shirt every day."

There is a close parallel with indirect lighting. It is inefficient and unlikely to be used where a high illumination for good working conditions is required. Completely indirect lighting therefore proclaims "this is not an interior where work is done and the lighting has been provided with little regard for the cost." The implications are of leisure and luxury. The type of distribution, as well as obviously expensive fittings or their abundance, can suggest affluence and so success.

This appears most clearly in shop lighting. Display lighting can, of course, contribute enormously to sales by showing the goods strikingly and to their best advantage, but lighting's contribution to atmosphere can be equally important. This is immediately obvious in some trades, such as hairdressing and women's clothes, but the same thinking applies to grocers and ironmongers. Of all atmospheres, that of success is the most important. A shop must not only do well; it must be seen to be doing well.

In terms of engineering and economy, a luminous ceiling may do all that is necessary in a car showroom, say, but the lighting salesman, conscious of our society's tendencies, will sell the luminous ceiling and a row of decorative glassware pendants as well. The showroom will look more luxurious, the sweet smell of success will be about and events will prove it no illusion. The obviously atmospheric applications of light tend to be the least efficient so that there is an electrical overtone here to the "conspicuous consumption."

In the commercial world the new office buildings which are springing up are pointers to the working environment of the future. Prestige and display may be treated more subtly than in shops and showrooms but they remain essential factors. Some of the most adventurous, attractive, and—this is the point—apparently extravagant lighting schemes are to be found in reception areas, directors' offices, and board rooms. There are signs of improvement in general offices too. One can argue, reasonably, that the wage bill is now so high that it is uneconomic not to give office workers the conditions that will mean their efficiency is as high as possible. But beyond this, in an affluent society, people are less afraid of being out of work and more likely to be looking round for alternative jobs. Working conditions may be more important than minor differences in pay. The lighting needs not only to be well engineered but also to contribute to the satisfying feeling of belonging to a successful organisation.

A society with more money to spend is depicted in an advertisement of a housewife choosing a new lighting fitting

Lloyds Bank is helping this young mother to run her home

Are you sure they couldn't help you?

It is a characteristic of affluence that capital is available. One may expect to be increasingly successful in persuading people to take the long view, to accept higher installation costs, provided there is the promise of ultimate economy.

The most striking effects of increasing prosperity on lighting may well appear in the domestic field—the biggest single lighting market—if only it can be exploited. The public believes that a 100 W lamp in a central fitting is all that any room needs. This is not true, even in a strictly utilitarian sense. But, in getting the householder to use more lighting (or rather, in influencing his wife to insist on it), talking of what is necessary and the economy of providing it will have much less effect than stressing decorative effect.

The great thing about lighting is that it shows. There could hardly be a simpler yet more telling way of being one up on the Jones's. The public image of luxury is very much tied up with lighting. Look at any stage, film, or television setting designed to show life as the rich live it and you will find a welter of floor and table standards. The possibilities of fluorescent lighting in the home have scarcely been touched. The utility angle—kitchens, garages, and so on—has been urged but the real potential lies in concealed decorative applications.

These are but a few of the fields where a different approach may prove valuable. The lighting market is likely to expand and to go on expanding. But the point is essentially that, if this situation is to be exploited to the full, economy and efficiency are not the only themes that should be emphasised. In lighting promotion our slogan for the future, for an affluent society, might be: "Lighting is one of the cheapest ways of being extravagant."

* Based on a talk given by Mr Boud on behalf of the British Lighting Council, to the Norfolk Electrical Circle.

Benson boiler at steelworks

A BREAK-AWAY from traditional methods of steam generation has been made by the Steel Company in Wales in recently completed extensions to their Margam power station.

For the first time in this country, a once-through Benson boiler has been brought into service, which generates steam at 240 klb/hr, 1,060°F and also operates at a supercritical pressure of 3,300 lb/sq in. The idea of a once-through boiler was first conceived in this country by Mark Benson in the 1920s, but all subsequent development has taken place on the Continent.

In the once-through boiler the transition from water to steam takes place in a single pass through heating surfaces consisting of tubes and without the usual water drums. By operating the boiler above the critical pressure of 3,206 lb/sq in., change from the liquid to vapour phase takes place without ebullition and there is no absorption of latent heat.

The design has many advantages, for the high pressure operation necessary to give optimum operation at the 240 klb/hr steam flow required for the power plant.

Steam from the boiler drives a 9·5 MW turbo-alternator, operating with t.s.v. conditions of 3,000 lb/sq in. and 1,050°F and exhausting at 650 lb/sq in. and 670°F. This is believed to be the highest operating pressure used for a turbine in this country. The turbo-alternator will operate as a base load set supplying a large part of the normal works demand which, at present, totals about 60 MW.

Extensions to the Margam and Abbey works have created an additional steam demand for driving turbo-blowers, generators and process plant of approximately 200 klb/hr and this will be supplied from the turbine exhaust. The new installation thus operates as a "topping" plant and feeds exhaust steam into the existing 650 lb/sq in. steam mains.

Boiler Construction

The boiler is arranged with four passes, each directly behind the other. The first pass follows the combustion zone, whose walls form the radiant superheater. Gases entering the first pass move upwards through a first evaporator section then through a two-section final superheater into a further three-section evaporator in which the change of state from water to steam occurs.

The gases fall through the second pass containing reheat sections arranged in parallel and each comprising two sets of tubes, then rise through a third section consisting of the secondary economiser; also with sections arranged in parallel and with three banks of tubes. The final pass down the full height of the boiler includes secondary tubular air heaters, primary economisers and, finally, primary air heaters. At the bottom of this pass the gases are exhausted by i.d. fan to the chimney.

Boiler Steam Conditions.

Steam pressure at superheater outlet	3,300 lb/sq in.
Steam temperature at superheater outlet	1,060°F.
Feed water temperature at economiser inlet	280°F.
Continuous maximum rating	240 klb/hr.
Quantity of steam to the reheater	205 klb/hr.
Steam pressure at reheater inlet	650 lb/sq in.
Steam temperature at reheater inlet	675°F.
Steam pressure at reheater outlet	628 lb/sq in.
Steam temperature at reheater outlet	836°F.

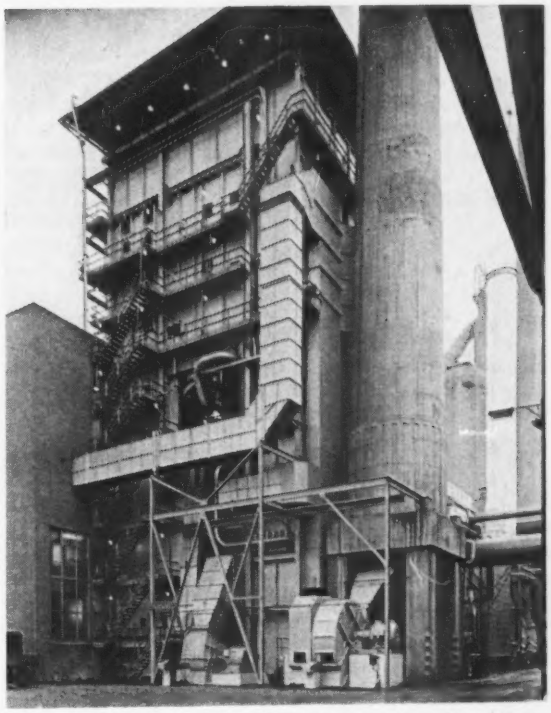

Fig. 1. Showing outdoor construction of the recently completed Benson boiler at the Steel Company of Wales' Margam works. Steam, generated above the critical pressure at 3,300 lb/sq in. and 1,060°F, supplies a 9·5 MW back pressure turbo-alternator

In the Margam installation, a reheat cycle is employed to raise the temperature of the back pressure turbine exhaust steam to 836°F before it is passed into the 625 lb/sq in. steam main for process application.

Reheater steam temperature is controlled by dampers in the upper rear walls of the first pass, which regulate gas flow into the upper evaporator banks or partially by-pass the gas into the reheater banks. The heating surfaces consist almost entirely of small-bore tubes from 1¼ in. to 1½ in. o.d.

Fuel Supplies and Feed Water

The boiler primary fuel is blast furnace gas having a calorific value of 92 B.T.U./cu ft at 32°F and 30 in. Hg, but any fluctuations in the supply of this gas are automatically made up by auxiliary oil-burning equipment using fuel oil with a calorific value of 18,000 B.T.U./lb. However, there is always in use a pilot oil flame of about 10% of the total fuel burnt.

A recirculating fan is provided to balance the superheater and reheater temperatures when burning fuel oil.

Feed water is supplied to the boiler by a 253 klb/hr pump producing a head of 4,700 lb/sq in. and running at 4,500 r.p.m. The pump is driven by a turbine. A standby pump with the same rating is driven by a 2,400 h.p. 1,480 r.p.m. 11 kV motor with direct-on-line starting.

Turbo-Alternator

The back-pressure is designed to give an output of 9·25 MW when supplied with 240 klb of steam per hour with the t.s.v. and exhaust conditions given above. A double-walled construction has been used for the turbine

with the outer cylinder of conventional flanged design and the inner cylinder formed in two halves held together by shrink rings.

Steam enters the turbine through combined stop and emergency valves, each of which is in an integral chest with two nozzle valves. These chests are located on each side of the turbine. The turbine rotor has a single row of impulse blading and 14 rows of reaction blading. The reaction blading is machined from solid bar with integral shrouding and welded together at the shrouding in packets of three or four. The dummy piston has 39 gland strips and there are 30 gland strips at each end of the rotor. The main glands are provided with two pockets for tapping steam at 175 and 15 lb/sq in.

High steam pressures and the use of single-seated valves require the use of h.p. oil to actuate the servo motors and this is supplied from a pump driven from the front end of the turbine. A conventional gear pump provides lubricating and governing oil.

The turbine rotor runs at 9,500 r.p.m., weighs 1,300 lb and is 6 ft 6 in. between bearing centres.

The alternator is a conventionally designed machine driven by the turbine through epicyclic reduction gearing. It has a c.m.r. of 9·5 MW at 0·7 p.f. lagging and 10·5/11·5 kV and rotates at 3,000 r.p.m. The exciter is direct-coupled to the alternator shaft. Fans at each end of the rotor provide cooling in conjunction with a closed-circuit air-cooler.

Output Regulation

Because the Benson boiler installed at Margam is intended for burning blast furnace gas and fuel oil, control of air flow with steam flow based on the stoichiometric quantity cannot be used. The method adopted for the control of combustion is to measure the quantity of each fuel supplied to the combustion chamber and to control the forced draught fans to supply the total quantity of air required for both fuels. The two fuels can be fired in any proportion, giving wide variation in the CO_2 content of the flue gas; an O_2 meter is used as a reference for air supply to the boiler.

Control of the alternator output also differs from standard practice since it is not practicable to regulate the output through the turbine speed governor. At Margam, the turbo-alternator is arranged with pressure governing. To alter the electrical output, the boiler output is changed by resetting the master controller (described later), and the turbine throttle valves then operate to maintain constant pressure, under control of an Askania regulator unit, while accepting the steam flow determined by the boiler control setting.

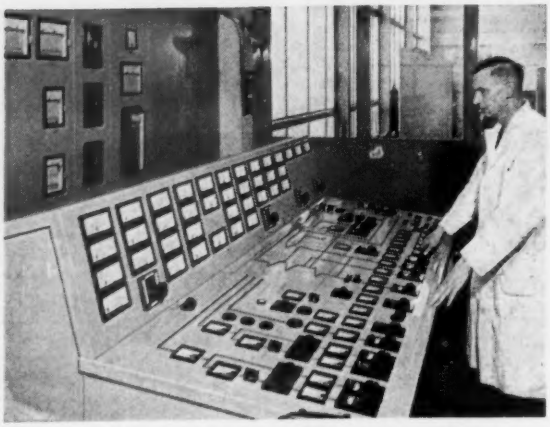

Fig. 2. Enclosed control room containing the centralised control panel for the Benson boiler and high pressure turbo-alternator set in the Margam "B" power station

The boiler output is itself controlled by the feed pump flow, in turn determined by a throttling valve. The final steam temperature is determined by the fuel/feed water ratio with more rapid trimming obtained by two stages of spray desuperheating. By varying the feed throttle valve setting, the additional facility is obtained of being able to run at less than the design pressure, a feature which has advantages in starting up the main turbine and also, because of the flexibility of the unit, starting up and shutting down procedure can be matched very satisfactorily with the turbo-alternator.

Control System

The boiler, which is of the semi-outdoor pattern, is supervised from an enclosed control room, which includes indicators and recorders for either auto-manual or fully automatic operation.

Under auto-manual control, the supervisor operates dampers, vanes and valves through electric motors controlled by desk switches.

When fully automatic control is in use, the boiler output

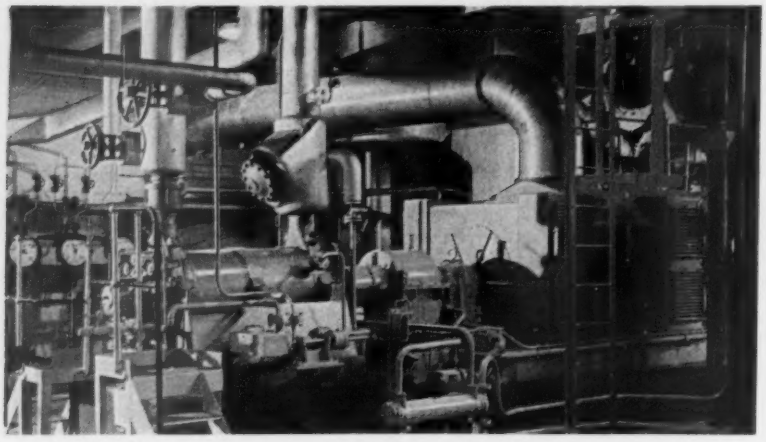

Fig. 3. Direct-on-line starting 2,400 h.p. motor driving the feed pump for the Benson boiler. A duplicate pump is driven by a steam turbine

Contractors for "Topping" Plant.

Main Contractors:	
Boiler plant	Simon-Carves.
Turbo-alternator	Richardsons Westgarth.
Principal Subcontractors:	
Boiler feed pumps and driving turbine	K.S.B. Manufacturing Co.
Pump motor	Bruce Peebles.
Boiler mountings and fittings	Hopkinsons.
I.D., F.D. and recirculating fans	James Howden.
Boiler panels, instruments and control gear	Siemens and Halske; Negretti and Zambra; Honeywell Controls; Foxboro-Yoxall.
H.P. steam and feed piping	Alton.
Pressure reducing and desuperheating equipment	Siemens Schuckert (Great Britain).
Remote control equipment	Lockheed Precision Products.
Deaerator lift pumps	Mather and Platt.
Deaerator extraction pumps	Drysdale.
H.P. and L.P. feed water heaters	G. and J. Weir.
Lub. oil pump motors	Lancashire Dynamo.
Turbine governor, lub. oil tank and gland steam extraction fans	British Brown Boveri.

is determined by a load-setter consisting of a series of rheostats driven by a pilot motor which can be rotated to change the load setting from the control desk. The rheostats send out signals to the fuel controls immediately a change in setting is caused. Delayed signals also vary the feed water flow and steam temperature, the delay ensuring that on rising load the combustion chamber does not cool too rapidly. Conversely, on falling load the fuel flow is reduced before the feed water flow.

An error signal derived from the rheostat and a position signal obtained from potentiometers coupled to flow meters in the blast furnace gas and oil flow lines is amplified and operates the fuel actuators.

Similarly, a signal from the feed water control rheostat setting is compared with the actual water flow and this operates the throttling valve through a magnetic amplifier and actuator. The high pressure steam temperature is controlled in two stages, one being by water injection at a rate determined by a rheostat setting, compared with a thermocouple in the first stage desuperheater, while the second stage is controlled directly from a thermocouple measuring final steam flow temperature.

Conclusion

Before the decision was taken to adopt the Benson construction, a complete cost comparison was made by the Steel Company of Wales of the topping installation and a normal system operating at 625 lb/sq in. This investigation, which also included much information obtained from Continental Benson installations, confirmed that the topping installation was practical and economical.

Total electricity capacity in the existing power stations at Margam is approximately 30 MW, representing only about half the normal demand and about one-third of the maximum demand. The existing "A" station has five water tube boilers fired by blast furnace gas and oil and generating a total of 500 klb/hr of steam at 625 lb/sq in. and 820°F. These boilers feed four turbo-alternators, two of which are back-pressure sets and the other two condensing, and in addition three back-pressure turbo-blowers. The "B" station has a single 200 klb/hr boiler with the same steam conditions as the "A" station, supplying a pass-out condensing turbo-alternator and a condensing axial-flow turbo-blower. It is in the "B" station that the Benson boiler and turbo-alternator have been installed, together with a further turbo-blower.

By installing a critical pressure boiler and back-pressure turbo-alternator, a considerable saving has resulted in electricity generation, since the back-pressure steam, in addition to providing an extra 9·5 MW of power, also meets the expanding process steam requirements of the plant. Although a Benson plant can be designed and built for pressures up to 5,000 lb/sq in. consideration of the factors involved showed that, for the steam flow required at Margam, above 3,300 lb/sq in. the main turbine efficiency began to drop and in addition the feed pump power requirements became out of proportion to the total power generated.

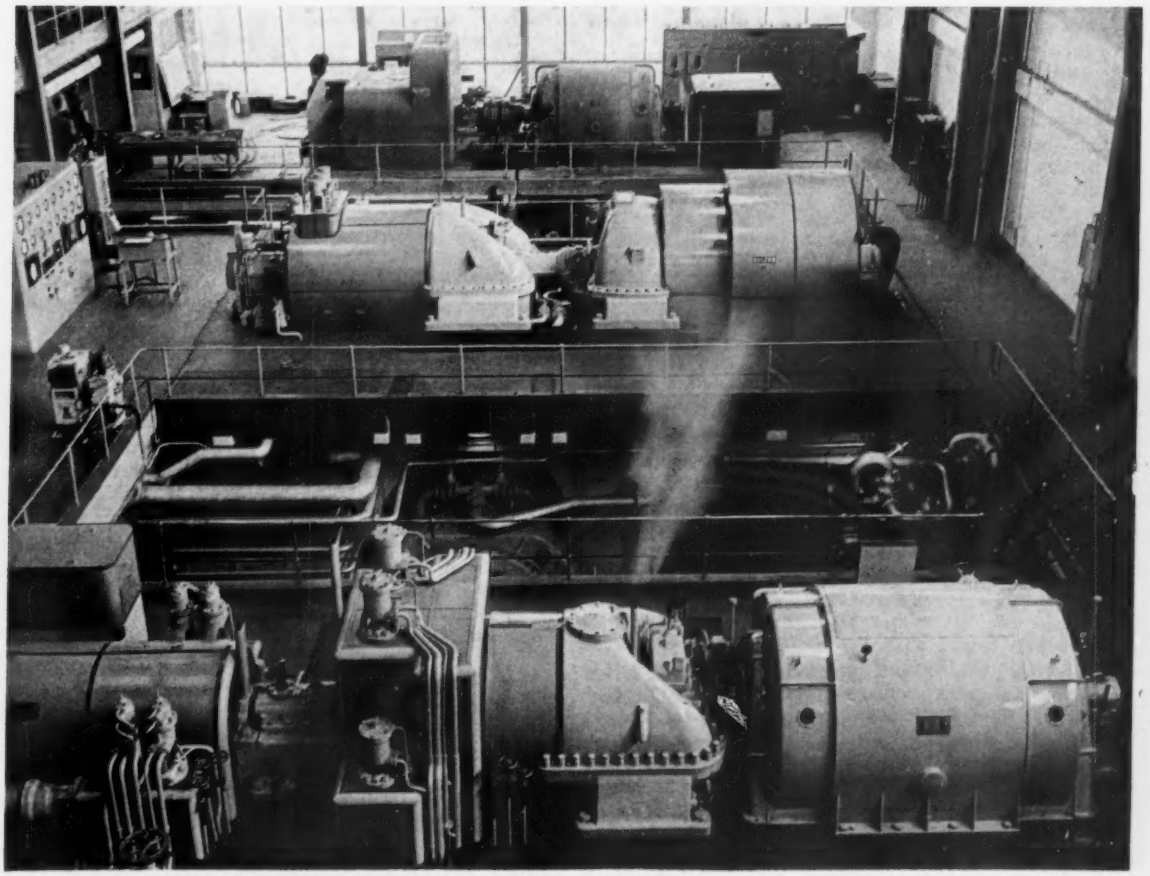

Fig. 4. General view of the "B" power station at Margam. In the foreground is the existing turbo-alternator set. The high pressure 9·5 MW set is in the background, and the new turbo blower unit in the centre

Economics of the nuclear power programme

COSTS PREDICTED AT W.P.C. MADRID MEETING

AT high-load factors, the cost of power produced from nuclear and conventional plants will be comparable at some date between 1965 and 1970. But about that time, system operating factors will be becoming unfavourable to nuclear power. This is the conclusion reached by Sir Christopher Hinton and two other CEGB members in an important paper* presented last week at the Madrid sectional meeting of the World Power Conference. In this paper, first the probable trend of costs in conventional fossil-fuel power stations is studied; then costs for nuclear stations. Finally, the two sets of predictions are combined.

Conventional Station Costs

Study of the past history of coal-fired power station development suggests four conclusions about cost reduction.

1. Capital cost per unit of generating capacity decreases exponentially with the rating at the rate which gives a reduction of 20% in cost per kW for 100% increase in rating.
2. Considering station capital costs additional to those of plant items making up the boiler and generating unit proper with its cooling system, 10% vary directly with the heat rate of the station. (Use of cooling towers assumed.)
3. For given steam conditions, the heat rate of the generating unit decreases exponentially with rating at a rate which gives a reduction of 1% in heat rate for 100% increase in rating.
4. Improvements in manufacturing technology result in real costs of manufacture reducing exponentially at the rate of 2½% per annum.

These four guides need to be reconsidered for application to the years ahead, but over a decade or so it is thought they will remain valid. It is felt unlikely that the recent rate of increase in unit rating will be maintained. Apart from questions like forging limitations and transport difficulties, there is the consideration of size of set related to size of system. The authors put unit size (single-shaft machines) at 350 MW for 1964, 420 MW for 1966, 560 MW for 1970 and 700 MW for 1974; and within these size limits they consider that the capital cost reduction rate noted in (1) above will continue. They conclude that 420 MW set of 38% thermal efficiency could give a station cost of £42/kW in 1966, while in 1974, a 700 MW set of the same thermal efficiency could give a corresponding cost of £29/kW. However, these efficiencies may be uneconomically high.

Having settled their capital costs, the authors turn to trends in fuel prices, on the basis that coal will remain the basic fuel but that prices of imported oil will have an effect on what is charged for coal. They feel that national consumption of oil will reach its economic balance with competing fuels at a level which does not imply extended use of oil by the electricity supply industry. Overall, the conclusion is that for the next five years supply of fuel will be given at prices not exceeding those ruling in 1956. Indeed, coal prices may fall. Between 1965 and 1980, some low contraction in coal output may be expected to continue, and real costs of production should not increase by more than 0·6% per annum. Imports of natural gas after 1970 may have some effect in reducing coal and oil prices.

In money terms the cost of coal delivered to power stations is expected to be about 37d/million BThU in 1965, rising to around 42d in 1980.

Combination of capital cost and fuel cost predictions makes it possible to give values for the most economical sizes of plant to build for given system load factors. From these figures it is deduced that in 1970 cost per kWh for electricity from a station operating at 75% load factor will be about 0·52d; and in 1974, 0·50d. For a station operating at 40% load factor the comparable figures are 0·64d and 0·61d.

Nuclear Plant

When they come to consider nuclear plant, the authors have far less historical background from which to extend their predictions. They make it clear that the CEGB programme at present rests on the Calder Hall type of nuclear station (also called the Magnox design), followed by the AGR design, although they select the steam-cooled heavy-water moderated reactor as the most promising alternative system.

Even within the Calder Hall type of nuclear station there has been considerable progress with specific fuel rating. Whereas Berkeley and Bradwell have a rating of about 2·1 MW heat/tonne of fuel, for Dungeness the figure is likely to be 3·1 and for Sizewell 3·9. But these increases seem small compared with the jump to about 8 MW heat/tonne of fuel predicted for a commercial AGR design in 1968. (The Dungeness and Sizewell figures assume that the Magnox canned fuel element will be modified to a hollow rod design or the like.) It is thought likely that a characteristic feature of an economic design of AGR station will be that it will have a large output.

Reactor gas outlet temperatures, of importance in determining the thermal efficiency of the steam cycle associated with a nuclear reactor, are thought unlikely to exceed 400°C for Magnox stations. In AGR stations, 500°C should be possible initially and 550°C later.

In the long-term, cost of uranium fuel should decrease although it will be kept up for some time by long-term contracts still having many years to run. Effective cost of nuclear fuel is a complex function related to the quantity of contained fissile material, the fuel element design and the cost of canning material. A vital factor is the amount of heat that can be extracted before a fuel

* Paper No. 8: "The Economics of Nuclear Power in Great Britain," by Sir Christopher Hinton, Mr F. H. S. Brown and Mr L. Rotherham.

element has to be withdrawn from the reactor for processing. It is thought that beryllium-clad uranium oxide, as used for the AGR reactor, will give a burn-up of 6,000 MW-days/tonne average, perhaps 10,000 MW-days/tonne with stainless steel cladding. On the other hand, it has still to be proved that Magnox fuel elements can give the average of 3,000 MW-days/tonne usually assumed.

There results from these considerations the conclusion that a nuclear station commissioned in 1970 should be capable of generating at 75% load factor at a cost of 0·42d/kWh; although the authors feel it wise to add 10% to cover development costs and allow for uncertainties. They point out that the rate of progress assumed will be possible only if the nuclear power programme is large enough to permit at least one nuclear station to be built every year. Also, it is thought that by 1970, the AGR will be reaching its limit of development and that new types of reactor will be taking its place then or soon after. In the calculations, the fast-breeder (Dounreay) type is assumed, but a further high-temperature gas design is another possibility.

Combining the cost calculations, Fig. 1 is obtained. It is, of course, highly idealised. The authors warn, in particular, that the discussion of lifetime as distinct from initial load factors is a complex matter. With the present size of nuclear programme the earlier nuclear power stations are likely to operate at a very high load factor, but should the total plant programme consist of only nuclear plant, then the average lifetime load factor will become that corresponding to system load factor, perhaps 50% in the 1970s.

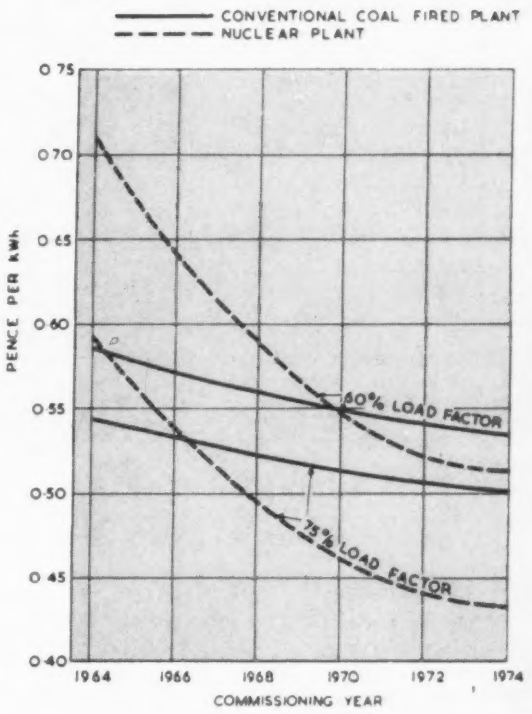

Fig. 1. Trends in generation costs of nuclear and coal-fired generating stations likely to be built by the CEGB

Design Improvements

A detailed study of the way in which improvements have been secured in the Magnox design of nuclear reactor is given by Mr R. D. Vaughan (chief engineer, Nuclear Power Plant Co.) in Paper No. 11, presented to the meeting. Most of the technical changes are related to increase in gas pressure above that used for the Bradwell and Berkeley designs. The progress has been such that it is expected that Dungeness and Sizewell power stations will have a specific plant cost of 30% lower than that of the first two stations. (Plant costs in Mr Vaughan's paper are related to a complete power station terminating at the transformer h.t. terminals, but exclude purchase of land, first charge for fuel; 1960 money values are used.)

Bradwell and Berkeley both have a carbon dioxide working pressure of about 150 lb/sq in. For Hinkley Point and Latina, pressure will be 200 lb/sq in., for Trawsfynydd 255 lb/sq in., and for Dungeness and Sizewell—contracts still to be awarded—the figure is expected to be about 300 lb/sq in. The gas pressure is being obtained more cheaply than before, in that smaller vessels are being used to contain a given core and the cost of plant and associated civil works is reducing. The high gas pressure improves steam conditions to the turbines and also helps in overcoming the notorious problems of Wigner energy storage in the graphite.

One of the most important advances contributing to higher gas pressures is plate thickness. The Bradwell spherical vessels used 26 ton steel plate of 3 in. thickness, reinforced in parts to 4 in. On subsequent vessels thicknesses up to 4⅛ in. in 28 ton steel are being used satisfactorily, but the higher figure is approaching the present technical limit. The temperature at which the reactor vessel operates has been cut down in some cases by use of internal metallic insulation. This is a relatively expensive item, but it helps to remove limits on pressure fixed by risk of creep occurring during reactor lifetime. Further advantages have been gained by better geometric utilisation of the pressure vessel in terms of the equipment that has to be kept inside it and the standpipes that provide access to it.

Although further increases in pressure may be possible as far as the pressure vessel is concerned, limitations are beginning to appear elsewhere in the gas circuits. Design of gas valves and expansion bellows to work at 300 lb/sq in. for 6 ft diameter gas ducts is difficult and, as the unit size of boilers increases, the thickness of plate that has to be used begins to approach the limits for weldability on site. As a general criterion, Mr Vaughan suggests that high gas pressures become uneconomic when the same standards of manufacture and inspection are required on the boiler shelves as on the reactor vessel.

Increase in gas pressure improves heat transfer properties in terms of the ability to extract more heat per unit length from the fuel without increasing blowing power. This leads to reconsideration of fuel element design, hence the possibility of hollow rod fuel elements for Dungeness and Sizewell. Overall, there seems little to be gained by raising pressure beyond 300 lb/sq in. for reactors of about 250 MW electrical output with steel pressure containers. For smaller output reactors, lower pressures are appropriate, while if concrete pressure vessels replaced steel reactor vessels and hollow fuel rods the present solid fuel elements, higher pressures might become attractive.

A sectional meeting of the World Power Conference was held in Madrid from 5 to 9 June. This is the first of a number of articles which will survey papers presented at that meeting

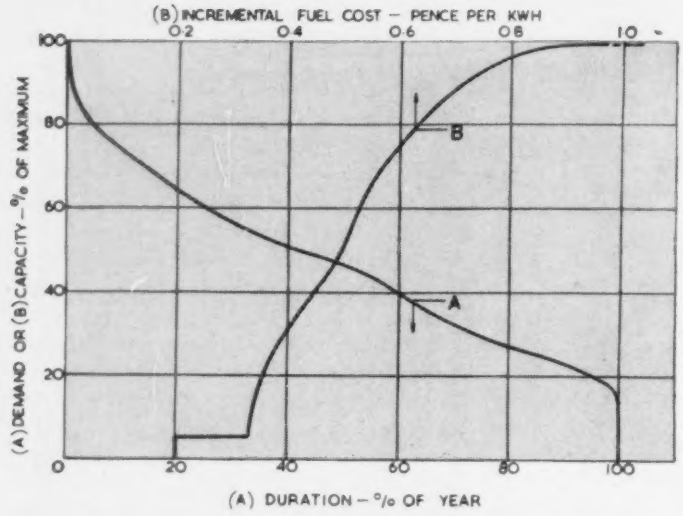

Fig. 2. Annual duration of load demand on the CEGB system (A) and the fuel cost per kWh for increments of generating capacity in 1964 (B)

Size Limitations

During the few years that nuclear power stations have been designed, electrical output per reactor in the UK has increased from 137 MW to 275 MW. Beyond 275 MW further reductions in specific plant cost are possible, but it would be necessary to double output again to save another £10 to £12/kW. Various complications arise as output increases. For instance, it is difficult to secure a good layout of plant with more than six gas circuits per reactor. Also, with increases in the power required for gas circulators, the design of variable speed motors (needed for unit sizes of 5 MW and more) becomes difficult. In this field, attention is now turning to direct steam turbine drives for the blowers.

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What is involved in bringing nuclear power stations into use in a large integrated generation and transmission system is dealt with by three CEGB authors in Paper No. 6,* delivered to the Madrid meeting. Load factor, as already mentioned, is the important parameter and Fig. 2 shows this in terms of annual duration of load at present, as well as predicting incremental fuel costs for 1964.

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With nuclear power amounting to only 6% of total system capacity, the only limitation will be the availability of the nuclear plant itself. For planning purposes this has been assumed to be 75%, believed to be a conservative estimate. It has been assumed that system load factor will rise to 50% and calculations on this basis have been made, allowing for restrictions imposed by transmission system considerations. From such studies it is deduced that the proportion of nuclear plant could approach 30% of total capacity before the annual load factor of the next increment of nuclear plant fell below 70%—in other words, before nuclear plant had to be operated other than on base load.

Involved in this estimate is the need to envisage quite large short-term shut-down of nuclear plant; about half the output of the 30% envisaged might have to be dropped during summer nights at weekends. There will be experience of the practicability of such output reductions long before there is 30% nuclear plant in the system. Energy storage, as by pumped storage stations, could, of course, relieve the position, for nuclear energy based electricity surplus to consumer demand could be used for pumping. All-in-all, it seems reasonable to suppose that the nuclear stations now under construction and projected will enjoy high load factors for many years.

Nuclear power station siting has to be considered in relation to transport costs for coal. Cost per therm of delivered heat in coal can range from 3·0d in the Midlands to 5·6d in London because of the transport charges. Nuclear power is virtually independent of transport costs, one ton of uranium providing the energy output of 1,000 tons of coal. Heavy water requirements of nuclear stations are another siting limitation; about twice as much cooling water is required as for the latest coal-fired stations of equivalent capacity working at 2,300 lb/sq in., 1,050°F.

Only slight adaptation of the 275 kV transmission system has been needed to accommodate nuclear power stations. However, before the nuclear programme was introduced, it was planned to provide, by 1960, some 2,000 MW of transmission capacity to southern England. Of this, 1,200 MW was for interconnection and 800 MW was for bulk transfers from Birmingham Grid Control area. There was also to be some 1,200 MW to north west England, of which 400 MW was for bulk transfers. The decision to build Berkeley, Bradwell and Hinkley Point has permitted deferring erection of one of four lines running south from Birmingham until 1964.

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Overall, the conclusion is that a system capacity of 35,000 MW permits the fullest utilisation of 5,000 MW of nuclear plant and, with single-circuit transmission capacity of 500 to 600 MW, there is no difficulty in accepting reactor units of 250 MW electrical output.

* Messrs D. Clark, P. W. Cash and F. Faux: "The Integration of Nuclear Power into a Large Electricity Generating System."

Electrical heating for industrial processes and plant—PART I

by A. E. Williams, Ph.D., F.C.S.

WHILE electricity does not always compare favourably with other heating mediums so far as cost is concerned, there are many instances in which this form of heating is the only practical one. It is in the latter field where electricity has advantages not possessed by other forms of heating. Electric heating is a flexible medium and may be applied to the exact location required without any appreciable heat loss. Moreover, electric heating attains its maximum heat within a very short time of the power being switched on and, as no appreciable heat is stored, temperatures of equipment can be reduced rapidly when needed. As soon as the heating operation is complete, the power can be switched off, and there is no wastage of fuel. In flameproof areas, electricity is generally the only safe method of applying heat to attain any appreciable elevated temperature. Heating by electricity may be accomplished by the use of mantles, tapes and combinations of these; the heating elements being incorporated in these materials.

Road Transport

There are numerous types of materials that have to be transported by road tanks and which are solid when cold and liquid when hot. Such materials have to be heated in order to load the road tank and if the latter is not heated the tank contents cannot be emptied at the end of the journey until prolonged heating has been applied; this means loss of time and heat. Lagging of road tanks to preserve the heat of the contents may be satisfactory on short-distance work, but if there is some unavoidable delay on the journey the contents will solidify and the re-melting of these is a laborious process which immobilises the vehicle for a long time. Loading the material into the road tank at as high a temperature as possible to provide a reserve of heat is unsatisfactory because hot liquids lose heat more rapidly than cooler ones, and high loading temperatures are thermally wasteful. Also, many materials take unkindly to high temperatures.

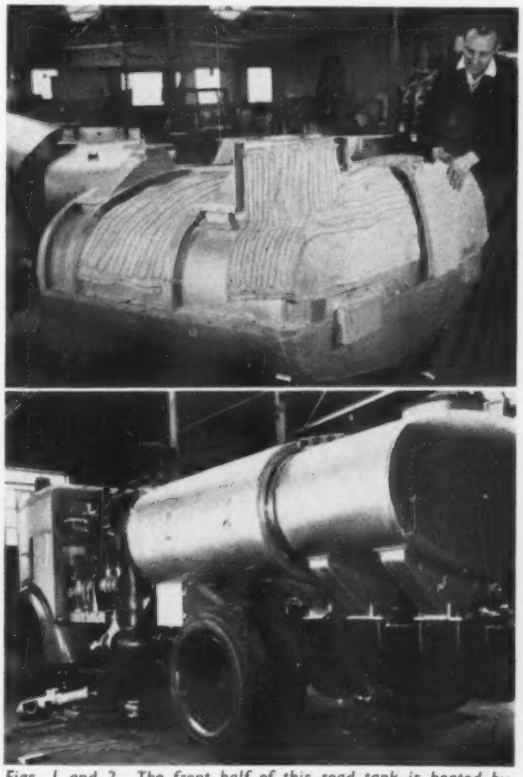
The idea of heating the road tank itself while the material is on its journey is not new, and both exhaust gas from the engine and cooling-water heat exchangers have been tried, but the limited amount of heat available from the engine often makes these methods unsuitable. Electric heating, on the other hand, can be applied uniformly over the surface of the road tank, and the heater may be powered by a small generator set carried with the road tank. When the vehicle is stationary, electricity can be taken either from the generator set or from a mains supply. Where the material being conveyed is of an inflammable nature, the electric method of heating can be made flameproof.

With electric heating of the road tank, the material is loaded at, or slightly above, the desired transport temperature; the heater having warmed the tank initially to avoid chilling the incoming material, then serves to compensate for heat loss through the lagging. As there is always a possibility of complete breakdown of the loaded vehicle, the capacity of the electric heater is made sufficient to keep the tank contents liquid even over long periods. With normal running of the vehicle, the temperature of the tank contents can be maintained at any desired level by regulation of the heater; thus one tank can be used for several materials of different melting points.

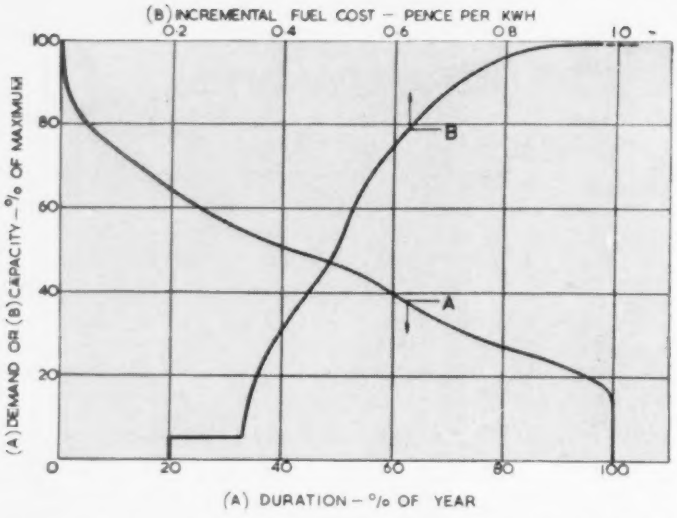
The method of attaching heating mantles to road tanks varies with the design of the tank. The elements may be attached to glass wool blankets (Figs. 1 and 2), tailored for the application and tied into position with lagging, and an outer cover applied overall. Another method is to apply the heaters in the form of lagging boxes, which are made from sheet metal to fit the contour of the tank. These lagging boxes incorporate an outer layer of about 3 in. of glass wool lagging. The heating mantle is fitted to the inner surface of the assembly, which is then screwed to the strengthening members surrounding the tank. For maintenance the screws are released and the lagging box is easily removed as a complete unit.

For flameproof road tanks, a different method of fitting is employed. The glass cloth which carries the flameproof resistance elements is provided with eyelets, by means of which the tailored heating unit is tied to bearer brackets welded to the tank. Glass wool pads are then applied and held in place by an outer shell, which is attached by quick-release fasteners engaging in the bearer brackets.

The loadings of the panels or mantles are normally between 10 and 50 W/sq ft where the whole surface of the tank is to be heated; but if only a part of the surface is to be heated, the loading may be up to 200 W/sq ft The heating assembly is commonly split up into sections or sub-circuits, so that if one section becomes damaged, it does not affect the working of the remainder. By connecting the heaters in parallel instead of in series, the electrical rating can be boosted to a level higher than for normal heating, to permit emergency heating if the tank contents have been



Figs. 1 and 2. The front half of this road tank is heated by electric panels fed from a diesel-generator behind the cab. Top, fitting electric heating panels to a road tank for the conveyance of lubricating oil. (Esso Petroleum Co. Ltd.)



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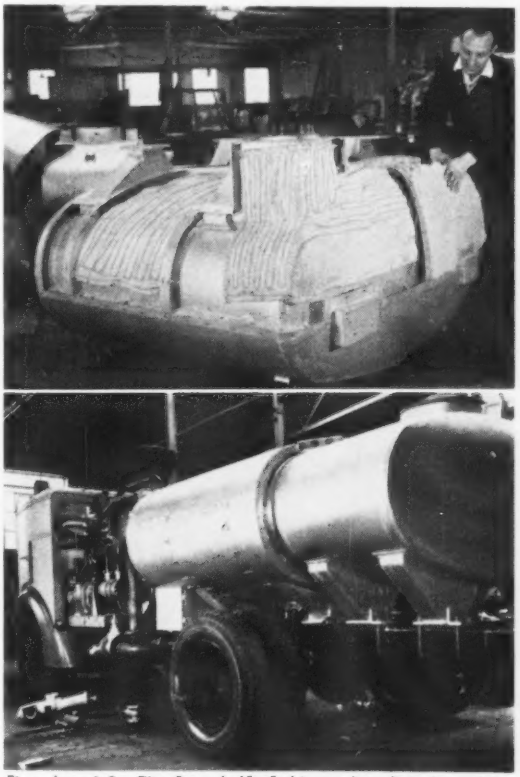
With electric heating of the road tank, the material is loaded at, or slightly above, the desired transport temperature; the heater having warmed the tank initially to avoid chilling the incoming material, then serves to compensate for heat loss through the lagging. As there is always a possibility of complete breakdown of the loaded vehicle, the capacity of the electric heater is made sufficient to keep the tank contents liquid even over long periods. With normal running of the vehicle, the temperature of the tank contents can be maintained at any desired level by regulation of the heater; thus one tank can be used for several materials of different melting points.

The method of attaching heating mantles to road tanks varies with the design of the tank. The elements may be attached to glass wool blankets (Figs. 1 and 2), tailored for the application and tied into position with lagging, and an outer cover applied overall. Another method is to apply the heaters in the form of lagging boxes, which are made from sheet metal to fit the contour of the tank. These lagging boxes incorporate an outer layer of about 3 in. of glass wool lagging. The heating mantle is fitted to the inner surface of the assembly, which is then screwed to the strengthening members surrounding the tank. For maintenance the screws are released and the lagging box is easily removed as a complete unit.

For flameproof road tanks, a different method of fitting is employed. The glass cloth which carries the flameproof resistance elements is provided with eyelets, by means of which the tailored heating unit is tied to bearer brackets welded to the tank. Glass wool pads are then applied and held in place by an outer shell, which is attached by quick-release fasteners engaging in the bearer brackets.

The loadings of the panels or mantles are normally between 10 and 50 W/sq ft where the whole surface of the tank is to be heated; but if only a part of the surface is to be heated, the loading may be up to 200 W/sq ft The heating assembly is commonly split up into sections or sub-circuits, so that if one section becomes damaged, it does not affect the working of the remainder. By connecting the heaters in parallel instead of in series, the electrical rating can be boosted to a level higher than for normal heating, to permit emergency heating if the tank contents have been



Figs. 1 and 2. The front half of this road tank is heated by electric panels fed from a diesel-generator behind the cab. Top, fitting electric heating panels to a road tank for the conveyance of lubricating oil. (Esso Petroleum Co. Ltd.)

allowed to get cold and set solid. An example of material which is carried in such road tanks is tar and pitch used in road construction. These materials can be transported over long distances when necessary, and the tank contents discharged hot ready for use at the end of the journey.

Heating Tapes

Flexible electric heating tapes (Figs. 3 and 4) consist of insulated resistance cord interwoven with high temperature glass yarn withstanding temperatures up to 550°C. Tough glass cloth covers the heating surface on each side, thus forming a fully-insulated pliable heating tape. The amount of heat applied to a given length of pipe or other surface to be heated by the tape may be varied either by using tapes of different loadings, or by altering the number of turns per unit length of pipe, etc. A typical tape widely used for keeping pipe lines at elevated temperatures has a loading of approximately 150 W/sq ft. The tape may either be traced along one side of the pipe, or spiralled around it, while the wattage per foot length of pipe is changed by altering the pitch of the spiral. With this tape temperatures up to 300°C can be attained and the normal procedure is to employ some form of thermal lagging to prevent excessive heat loss.

A tape having a heavier loading, 400 to 450 W/sq ft is intended for the heating of vessels and other equipment, as well as for heat compensation at higher temperatures. This form of tape, which will give a temperature up to 450°C, is normally employed with special controls to avoid accidental overheating. Tape with a similar loading, but suitable for use at temperatures up to 600°C, is made from quartz cloth instead of glass fabric, under suitable lagging; the quartz being capable of withstanding a higher temperature than the glass materials. As quartz cloth has poorer mechanical properties than glass cloth, this particular tape has to be handled carefully.

For use under wet conditions, the tape may have its heating element covered in temperature- and moisture-resisting rubbers, which remain intact at temperatures up to 220°C. Where only a slightly elevated temperature is required, up to 70°C, the tape may be covered with plastic materials and as such tape is waterproof it is particularly suitable for outdoor runs of fuel lines, de-frosting, anti-freezing and other moderate temperature applications.

For use in flameproof areas, the electric heating tapes make use of a metal-sheathed extruded magnesium-insulated heating element which terminates in flameproof glands. Where temperatures of 200°C will not be exceeded on the heating element itself, a copper-sheathed element can be employed, otherwise a stainless steel-sheathed element is used. Resistance limitations of these elements determine the actual length and voltages at which the tapes for flameproof areas are run. In the 200/250 volt range, the loading in watts varies between 450 and 1,000; with tape lengths of between 30 ft and 70 ft. (The loading is not necessarily in direct ratio to tape length. It is possible to have a 500 or 1,000 watt loading with a 70 ft tape, while a 900 watt loading can be obtained from a 40 ft tape.)

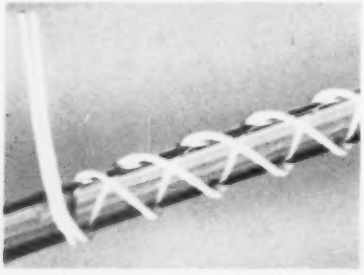


Fig. 3. Heating tape applied to a pipe, showing method of spiralling. (The Stabilag Co. Ltd.)

Tape Length and Loading

Tape length and loading is determined largely by the temperature and length of pipe line that have to be considered. A short pipe line that has to be kept very hot is covered with a short tape with heavy loading; a longer pipe line requiring only a moderate temperature would be taped with a correspondingly longer tape having only a light loading. Within the 110/125 volt range, tapes are generally from 15 to 30 ft in length, with loadings of between 360 and 22 watt. Where, for reasons of complete safety, a tape for only 50 volts is required, it may be between 6 ft and 30 ft in length, with loadings as low as 90 watt and as high as 290 watt; the width of the tape being 2 in. in each case.

Tapes for flameproof areas are otherwise similar to standard tapes, consisting of special weave glass cloth enclosing the heating elements, which are fixed at approximately 1 in. centres. Due to the nature of the heating element, repeated bending has to be avoided and spiralling on to pipes between 1 in. and 2 in. bore has to be done at a minimum of 3 in. centres so as to avoid acute bending of the tape. For moderate temperature work it is general practice to lay the tape lengthwise along the pipe and not wrap the tape round the pipe; this enables a given length of tape to handle a longer length of pipe than would be the case if the tape were spiralled round the pipe. However, where any appreciable temperature inside the pipe is required and the pipe has to be uniformly heated around its surface, it is clearly necessary to use the spiral method.

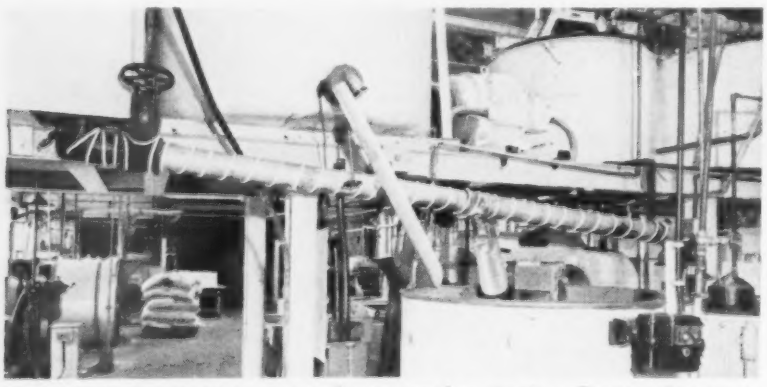


Fig. 4. Pipe line wound with heating tape, forming part of a works plant. The pitch of the tape is selected to match the required heat input per foot. (Electrothermal Engineering Ltd.)

Valves and Pumps

In any extensive pipe line system there are also valves and pumps and where the materials being handled in the system require heat to make them liquid, it is a great advantage to have a method of heating both the valves and pumps, because it is in these units that the material tends to collect after the end of the day's work. Various kinds of electric valve heaters are in use to suit different conditions and classes of valve. In many industries the heating of valves is of great importance due to the fact that any solid material left in the valve renders the unit inoperative until the material can be melted. The valve heaters range in size from those used on miniature pipe line control systems to 60 in. valves as used on main water and oil pipe lines (Fig. 5).

On the majority of main water supply lines, the pipes themselves may be well below ground or heavily lagged against frost, but the valves are not so well protected and if these freeze up in winter time, the valve cannot be operated. The provision of a simple valve heater maintains the valve in working condition so that it can be manipulated even in the heaviest of frosts. The heaters consist of a metal casing, underneath which is a layer of glass wool covering a glass weave heating section which follows the contour of the valve. The element itself is a high-temperature insulated resistance wire which terminates in a connecting cord of stranded nickel, which in turn is connected to a socket which receives a mains supply of electricity. Loadings of valve heaters are generally either 100 watt or 200 W/sq ft of heating surface.

In some cases the heater is in the form of a "U" with the open end at

the top, so leaving the top of the valve free for manipulation by wheel or handkey. Another type of valve heater is fabricated in two halves which may be hinged or bolted together, and enclose the valve and flanges completely, so reducing heat losses to a minimum. Such a valve heater may be moisture-proofed for outdoor operation and is generally employed where high efficiency is of first importance. For use in flameproof areas, the valve heaters use metal-sheathed, mineral-insulated elements leading into flameproof terminal boxes. The normal type of valve heater is designed for temperatures up to 450°C, while another type, employing quartz cloth element carriers and having an appropriate lagging thickness, is used for temperatures up to 700°C.

In a similar manner a pump may be enclosed in an electric heating mantle, which is made in two halves held in position by bolts and nuts (Fig. 6), the mantle being enclosed by a metal casing. A typical pump heating mantle consists of a mild steel or aluminium outer shell covering a layer of glass wool insulation. The glass cloth or quartz cloth heating surface, which is on the inside of the wool insulation, is constructed to follow closely the surface of the pump. Cut-outs for pipe inlets and outlets from the pump are provided in the mantle, and the loading of the heating element is arranged according to requirements. For example, a mantle with a loading of 300 W/sq ft may be employed when the material being pumped is easily kept in the liquid condition; while for materials of a higher melting point, a loading of 500 W/sq ft may be used. Pipeline tapes, valve heaters and pump heaters are often found operating together in one system, and they are popular in industries handling such products as heavy oils, tar, fats, waxes, bitumen, gelatine, glucose, etc. These heating units enable solids to be pumped that would otherwise have to be handled in the solid state, and the latter is usually slower and more cumbersome.

Other applications of electric heaters to industrial plant include the heating of drums and similar containers of products which need to be kept liquid. These applications are discussed in Part 2 of this article, when control methods are considered as well.

(To be continued)

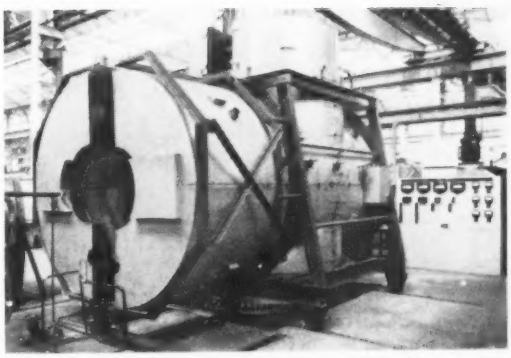


Fig. 5. Electric heating mantle surrounding a 60 in. valve. (Glenfield and Kennedy Ltd.)

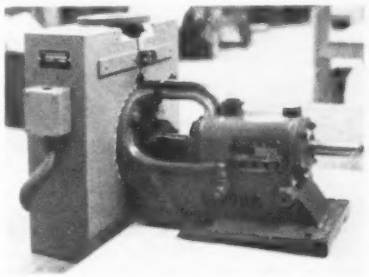


Fig. 6. Pump enclosed in an electric heating mantle. (Isopad Ltd.)

AUTOMATIC MEASURING OF TIMBER

A FULLY automatic measuring system, designed to both take advantage of the current higher speeds of automatic timber handling in docks and supersede manual measurement in timber yards is now in operation at Phoenix Timber Co. Ltd., Frog Island, Rainham, Essex. It comprises a central measuring computer and recording instrument which is connected by means of a few small accessories to a timber conveyor. This automatically measures the individual piece of wood for length and if required for width, and calculates area. It indicates the measurements on clearly visible indicators, and can also be arranged to print the length and width of each piece of timber on paper records. Simultaneously the machine computes the area, and stores this figure in an electronic memory. The accumulated total area figure of a batch may be printed on completion of the batch measurement or as required, for instance, for each load or complete delivery to a site.

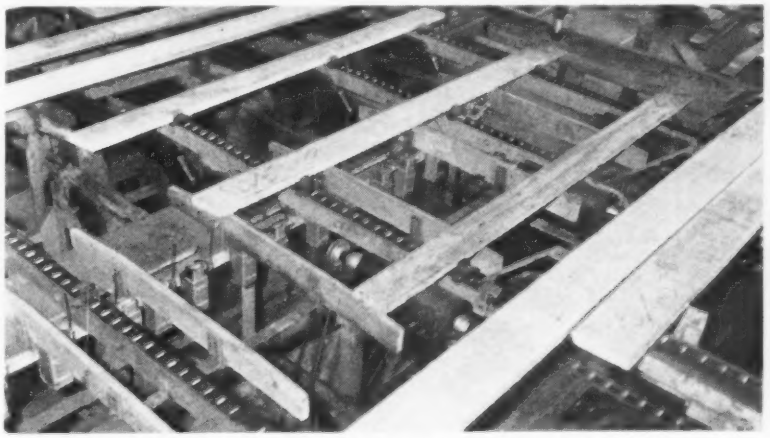
The equipment, developed and manufactured by New Electronic Products Ltd., 360 Kennington Rd, S.E.11, includes two possible systems of indication, one designed to give softwood measurements in numbers of individual lengths and the other which provides length and width measurement and area calculation for hardwood.

The softwood length counting system is in the form of number indicators for each length value. These each show the pieces of a specific size and a separate indicator gives the total of pieces in a batch.

Sensing Units

The sensing units using switches and photo-electric detector assemblies which measure the timber are small and compact and are positioned at suitable points on the conveyor and are connected by cables to the central unit, which may be at a convenient distance from the machine. Switches are positioned to indicate units of length at a central position on the conveyor base. Width-sensing units are positioned at one side of the conveyor adjacent to the length switches for this function. These three components are small and compact self-contained assemblies, which can be simply connected with cables to the main apparatus. The system is designed to be independent of the conveyor speed.

The central apparatus is housed in a compact metal enclosed cabinet. The printer, however, is a separate unit which may be positioned remotely from the cabinet should this prove to be convenient for operational purposes.



Timber conveyor chains showing micro-switches and photo-electric check

Protecting A.C. Motor Circuits

by J. L. Watts, A.M.I.E.E.,

PART 2: STARTER TYPES

THE starting current and heating of a motor during starting is affected by the type of starter and how it is used, and the type of starter also affects the protection afforded by a given overload release during starting.

Hand-operated starters, such as star-delta, series-parallel and auto-transformer starters, are provided with a sequence catch to prevent the starter being moved to the running position before it has been placed in the starting position. These catches should be maintained in working order to avoid incorrect use which might result in overheating during starting, particularly if the motor is started frequently.

It is usually desirable to allow a motor to reach a steady speed and current in the starting position before switching to run. Timing devices of automatic starters should be adjusted and maintained with this object in view. In most hand-operated starters of these types it is possible to switch from start to run before a steady speed has been reached. However, one type of starter, which is particularly suitable for unskilled use, has a dashpot device which compels the operator to pause for a certain period in the starting position.

In the event of a star-delta starter being left in the starting position due to a faulty starter or otherwise, each phase of the stator windings will carry the full line current, instead of 58% of line current which is the running (delta) ratio. Reference to the motor with d.o.l. characteristics given in curve (a) of Fig. 1 shows that if this motor is left running on 90% of its rated load with the star-delta starter in the starting position, it will then run at about 84% of synchronous speed. Each phase of the stator windings will then carry about 110% of the rated line current; i.e. about 190% of the current which the winding was designed to carry on full load, and early burn out is likely. Similar trouble might occur with a series-parallel starter.

Should an auto-transformer starter be left in the starting position the reduced voltage applied to the stator windings from the auto-transformer will cause them to take an increased current, with very slight fall of speed. The curves (e), (h) and (k) in Fig. 2 indicate the currents in the stator windings of a motor when running on 75, 60 or 40% voltage tappings, respectively, on the auto-transformer. The motor windings may overheat seriously on load if the motor is left running under these conditions.

There may also be a particular risk of overheating of the short-time rated auto-transformer if this is left in circuit too long, or if the motor is started too frequently. It is, therefore, most important to use the right type of starter. An ordinary-duty auto-transformer starter to BS 587 is suitable for two starts/hr, or two starts in a period of 15 min if a minimum cooling period of 60 min is allowed after the second start. An intermittent-duty starter is suitable for up to 15 starts/hr, or up to six starts in 15 min if a minimum cooling period of 15 min is allowed after six such starts. A frequent-duty auto-transformer starter is suitable for up to 40 starts/hr, with up to 12 starts in 15 min if at least 15 min cooling period is allowed after 12 such starts.

In the case of the automatic auto-

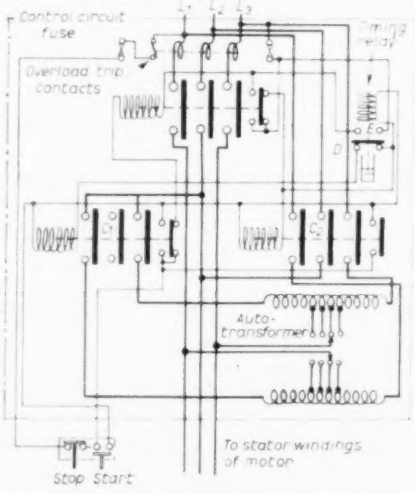


Fig. 3. Connections of an automatic auto-transformer starter for a three-phase motor

* Part 1 of this article appeared in the 19 May ELECTRICAL TIMES, p. 807.

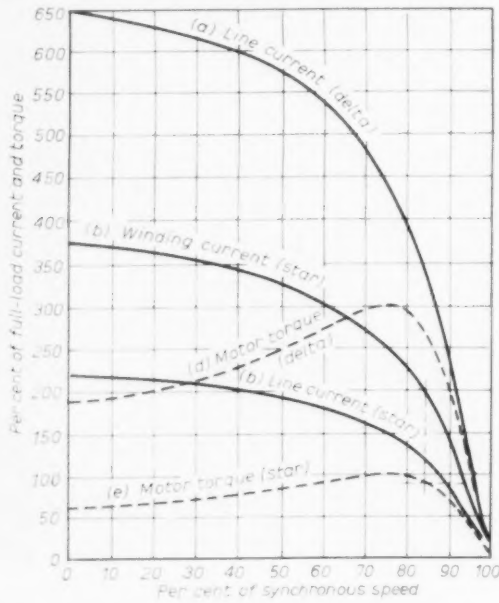
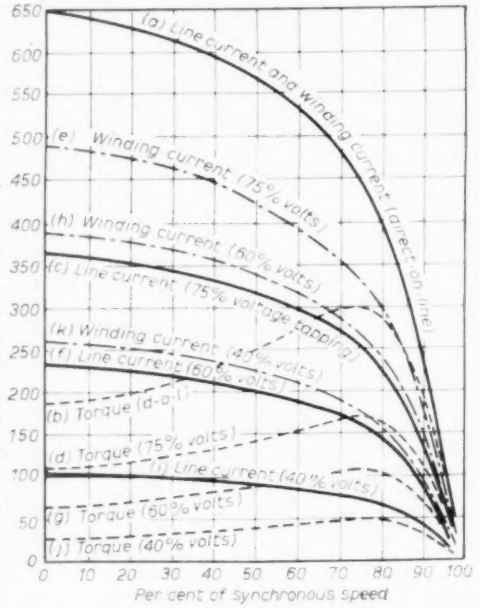

(a) Line current (delta)
(b) Winding current (star)
(d) Motor torque (delta)
(b) Line current (star)
(e) Motor torque (star)
Per cent of full-load current and torque
Per cent of synchronous speed

Fig. 1. Torque-speed and current-speed curves for a three-phase squirrel-cage motor in star and delta

Fig. 2. Torque-speed and current-speed curves for a three-phase squirrel-cage motor with an auto-transformer starter


(a) Line current and Winding current (direct-on-line)
(e) Winding current (75% volts)
(h) Winding current (60% volts)
(c) Line current (75% voltage tapping)
(k) Winding current (40% volts)
(f) Line current (60% volts)
(b) Torque (d-o-l)
(d) Torque (75% volts)
(i) Line current (40% volts)
(g) Torque (60% volts)
(j) Torque (40% volts)
Per cent of full-load current and torque
Per cent of synchronous speed

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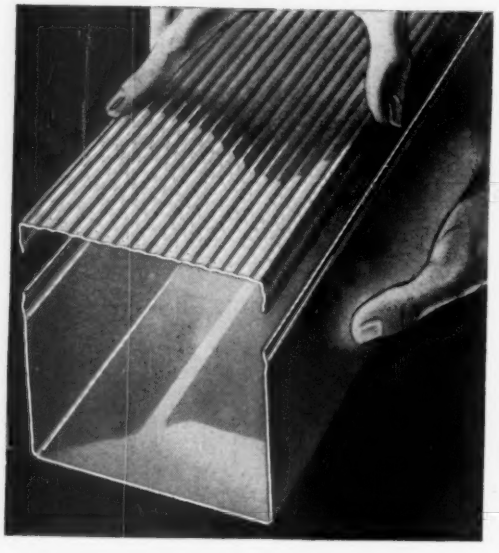

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transformer starter shown in Fig. 3 overheating of the auto-transformer, and possibly the motor, are likely to occur if the timing device is defective so that it does not open the contacts D a short time after starting, or if these contacts are not opened for an unduly long period during which the auto-transformer will remain energised through C_1 and C_2 and the motor will be fed at reduced voltage.

Degree of Protection

Since the winding-current/line-current ratio is greater during starting than running when a star-delta, series-parallel or auto-transformer starter is used, it follows that a given overload setting may afford less protection against faulty starting with these types of starters than would be the case with a d.o.l. starter. The reduced starting current will, however, enable lower overload settings to be used in most cases. To protect such motors against stalling or slow starting it would appear, from Fig. 4, that the overload device should cut off the current if it does not fall almost to full-load value in 6 to 120 sec after switching on, depending on the horse power; and/or if the current remains at about one-third of the stalled value for about one-third of those times.

With such starters, however, the motor windings may overheat due to excessive current, with no more than rated current flowing in the supply lines, if the starting operation is not completed, which is by no means unknown with an automatic starter. Where the overload devices are not intended to protect against short circuits or earth faults, it would appear that protection of the motor against non-completion of starting, as well as against mechanical overload, could be provided by connecting overload releases of suitable rating in series with the motor windings instead of in the supply lines, which should not be a difficult matter in many cases.

Even so, a short-time rated auto-transformer might overheat if left in circuit on reduced load, or if the motor was started too frequently. If it is necessary to protect against the former risk this could be done by connecting a thermal overload release in the primary circuit of the transformer, but to protect against the latter risk also the device would also have to be in proximity to the auto-transformer, so that it was acted upon by the transformer heating as well as its current.

Rheostatic Starters

Gates and ratchet devices of hand-operated rheostatic starters, and the timing devices of automatic starters, should be adjusted and maintained so that the starting resistors are cut out at the correct rate to avoid excessive current peaks. A line-resistance starter, or a rotor starter, may overheat if left in circuit, if the starting period is unduly prolonged, or if the motor is started too frequently. It is, therefore, necessary to choose the correct starter for the duty.

Subject to the initial current, and the peak currents between steps, not exceeding certain specified values, an oil-immersed, infrequent-duty resistor starter to BS 587 should be capable of one start/two hr or not more than two consecutive starts without allowing the starter to cool down to ambient temperature again. An ordinary-duty starter should be capable of two starts/hr, or not more than two consecutive starts without cooling down to ambient temperature. An intermittent-duty starter may be used for 15 starts/hr, an aggregate starting period of one min in 15, or repeated starting for two min if then allowed to cool to ambient temperature. A frequent-duty starter should be capable of up to 40 starts/hr, an aggregate starting period of two min in 15, or repeated starting for four min if then allowed to cool down to ambient temperature.

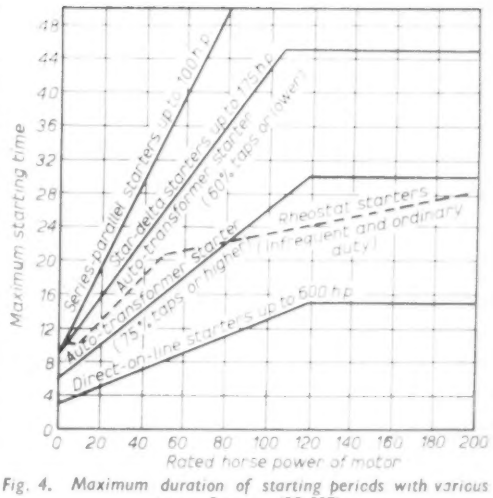
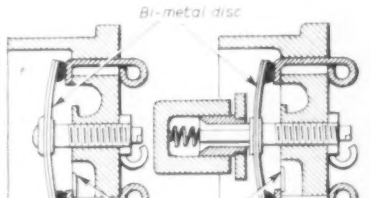

Maximum starting time
Rated horse power of motor
Series-parallel starters up to 100 h.p.
Star-delta starters up to 150 h.p.
Auto-transformer starter (60% taps or lower)
Auto-transformer starter (75% taps or higher)
Rheostat starters (infrequent and ordinary duty)
Direct-on-line starters up to 600 h.p.

Fig. 4. Maximum duration of starting periods with various types of starter (BS 587)

In general, fairly low overload settings can be used to protect a motor with rheostatic starter against faulty starting. However if a rotor starter is left in circuit by a faulty starter the motor is likely to run at much less than normal speed. Since, with normal voltage applied to the stator windings, the stator current depends mainly on the load resistance torque, this would not result in increased line current. Consequently line-connected overload releases cannot protect the starter against this risk.

Protection against overheating of oil-immersed starting resistors against non-completion of starting, unduly long starting periods, or too frequent starting, can be afforded by a thermostat placed in the oil and arranged to open contacts in the control circuit if the oil reaches an excessive temperature due to any cause. A thermal overload release could be used to protect air-cooled resistors against slow starting or non-completion of starting if heated by the last-stage resistor current. To protect also against too frequent use of air-cooled resistors, however, a thermal device of low heat-capacity would need to be placed in a position where it was heated directly by these resistors.



(a) Automatic reset type (b) Manual reset type

Fig. 5. Two types of motor protection thermostat

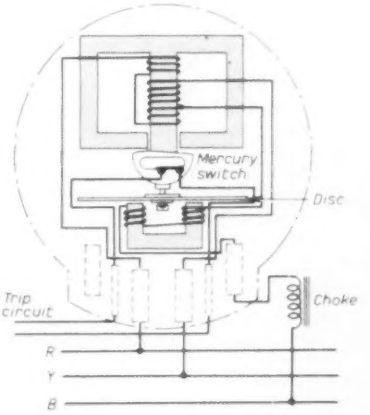


Fig. 6. Connection of one type of reverse-phase relay

Single-phase Motors

There may be a serious risk of overheating and burn out of short-time rated starting windings of a single-phase induction or capacitor-start motor if the motor does not quickly accelerate to the speed at which the centrifugal switch opens to de-energise the starting winding, if the centrifugal switch or starting relay sticks closed, or if the motor is started too frequently. Protection against the starting winding remaining energised too long due to any cause may be afforded by an overload release of suitable rating connected in the starting-winding circuit to control the input to the motor.

In the case of a small motor, protection against all these risks, and also against overheating due to overload or low voltage, may be provided by a bi-metallic device in a suitable position in the motor, this device being affected by the motor temperature and also by the motor current passed through the bi-metal or

a nearby heating element. The heating element compensates for the temperature gradient in the motor, which may be particularly high during sudden heating. The contacts of the device can be connected in series with a small motor, or in the control circuit of a larger machine.

Where a hand-operated starter is used such a current-temperature operated device would normally be designed to prevent the motor re-starting after it had cooled down again, in order to avoid possible risk due to unexpected re-starting. A manual-reset protector may then be used. The automatic-reset temperature of this device is below the normal atmospheric temperature, so that the device has to be reset by hand by pressing a button. An automatic-reset protector can, of course, be prevented from re-starting a motor after it has cooled down again if it is connected in the under-voltage release coil circuit of a hand-operated starter. An automatic-reset protector may, however, be desirable in the control circuit of a coil-operated starter, or directly in series with a small motor, in cases where it is required to avoid consequential losses arising out of a stoppage, as with a refrigerator motor. Two types of protector are shown in Fig. 5.

In some instances, as with lifts, conveyors, haulage and converting plant, danger may arise if a motor should start in the wrong direction due to accidental reversal of two phases of the supply, or alteration of connections on the supply side during overhaul or additions. Fig. 6 shows the connections of a three-phase reverse-phase relay which is designed to operate the auxiliary switch to prevent the controlled motor being switched on if the two supply phases are reversed. It also prevents starting if the line voltage is less than about 85% of normal, or if one line is open-circuited. The relay consists of an induction-type element, phase reversal causing the disc to be turned to open the mercury-tube switch.

(To be continued)

Fire Risk Check on Electrical Gear

MOTORS, transformers and switchgear are discussed from the aspect of fire risk in a technical information sheet (No. 5005), published recently by the Fire Protection Association. Much of the advice given is along lines of standard engineering practice, but there are some points which provide a useful check for works engineers.

Where motors are concerned, overheating leading to fire may arise from mechanical causes as well as electrical. Mechanical overloading is an obvious example, although correct setting of electrical protection for the motor should avoid it. The fitting of an ammeter on the starting panel, clearly marked to indicate motor overload current, can be a valuable safeguard against trouble from this cause. Dangerous temperature rise may also occur if motors are not properly suited to the work they have to do. Frequency of starting, if it is too high, may be troublesome in this way. Another cause of overheating is impairment of ventilation by absorption of airflow to the motor, as a result of ventilation channels or casing slots becoming clogged, or indeed of an increase in ambient temperature. Overheating from this cause may be the more dangerous since the increase in temperature will have no effect on the usual types of protective gear.

Inbuilt thermal devices directly responsive to winding or motor core temperature respond to overheating irrespective of its causes, but it needs to be kept in mind that there are limits to the closeness between the temperature sensed by the device and the hot spot temperature in the motor. In particular, there may be a significant time lag when a heavy overload occurs suddenly. It is possible to improve such thermal devices by incorporating a heating element carrying the motor current.

Starters and Controllers

Although motor starters are usually thought of in relation to the motors they control, it has to be remembered that they can themselves fail. Overheating is again the likely cause of trouble. Resistances and coil windings incorporated in motor starters and controllers are usually short-time rated. If left in circuit for longer than their design period, they are liable to overheating. The FPA publication suggests that the hold-on and no-volt coil on d.c. starters has been responsible for a number of fires through overheating — usually as a result of short circuiting of series resistances. Oil-immersed rotor resistances for slip-ring motor starters have caused fires as a result of carelessness, or defects in shorting-out contacts, which allow the resistance to be left in circuit, with overheating of the oil resulting.

In crane controllers fires have been caused when the connecting cables have been ignited by arcing from defective contacts, aggravated in some causes by a fault in the blow-out coil. This suggests that contacts, particularly in d.c. circuits, should be examined and if necessary "dressed" at frequent intervals. Use of non-combustible insulation for cables connecting starters of this type is a worth-while measure.

In starters as with other switchgear, it is clearly necessary to ensure that the short-circuit rating of the gear is sufficient for the circuit characteristics. While starters often incorporate series coils as part of their overload protection arrangements, the impedance of which protects the starter against the worst effects of a short circuit, such coils should be ignored in estimating the rating of back-up protection provided with starters.

Transformers

Transformers need attention, of course, to ensure that the condition of cooling oil remains satisfactory, and that excessive sludge does not accumulate to impede circulation of oil. Air- or nitrogen-cooled transformers may be appropriate in high fire risk areas, but it has to be borne in mind that such transformers lack the overload capacity provided by the large bulk of oil present in oil-cooled transformers, which retards temperature rise. On the other hand, oil temperature can be deceptive, offering no immediate indication of hot spots in the windings, which may cause local deterioration of insulation. The practice of providing a ballast-filled sump to absorb any oil escaping from a transformer under fault conditions is naturally endorsed in the publication.

Maintenance

In stressing the importance of regular inspection and maintenance in preventing fires, the publication includes a warning that, during the inspection of tanks which have contained oil, no means of ignition should be introduced, nor should any heat be applied (e.g., welding) until all traces of oil or vapour have been removed. Where tanks are large enough for a man to enter, ventilation should precede admission, and be continued as long as there is anyone in the tank.

Dust accumulations in motors, it is suggested, should be extracted as far as possible by vacuum suction, and the process completed by blowing through with compressed air. Clearances between stator and rotor in a.c. induction motors should be checked at least yearly.

The insulation resistance of motors and other major items of equipment should be checked regularly, and—this is the important recommendation—recorded so that any tendency to deterioration can be noticed. Calibration of protective gear should also be the subject of checks, together with its ability to operate satisfactorily, where a suitable test can be arranged. Where protective gear other than overload protection is concerned, such periodic checking is likely to involve measurement of the earth fault path resistance or impedance.

The technical information sheet is one of a series on matters of fire protection importance, issued by the Fire Offices' Committee Fire Protection Association, 31 Gresham St. London E.C.2.

NOTES ON WIRING

BY MEGOHM

SOME of the contracting industry's normal practices came in for pointed criticism during a discussion with someone who was having his house rewired. The original installation had been carried out in conduit with v.r.i. cables but over the years the system had been added to and altered and the materials used ranged from t.r.s.- to p.v.c.-sheathed cables, most of which had been installed in a manner which left much to be desired. It was decided to rewire the home (which has five floors) in m.i.c.c. cables, using the plaster-depth type of switch box and socket box, the cable to be run under floors and concealed in walls where possible.

The work went on in the normal way, but the method of laying the cable under the floors did not appeal to the client. Where the old conduit had been run the original chases in the joists were used to hold the m.i.c.c. cable and this met with a protest because of the possibility of someone knocking a nail into the cable. I pointed out that it was fairly normal practice to install m.i.c.c. cable in this manner and, quite often, lead-sheathed and/or t.r.s.-sheathed cables were similarly installed during a rewire to avoid further damage to the joists. The suggestion was made that it should be made compulsory for contractors to fit a metal shield over all such chases in joists to protect the cables. In some way I think this might be a good idea, but it would certainly raise the cost of the work. The shield, I might add, was described as being something of a "standard" item which could be purchased in bulk and made in such a way that it could be "sprung" into position by compressing the sides. I did point out to this person that it was possible to drive a nail through a conduit if the nail had been hammered into a board and, therefore, the same could, presumably, happen to a metal shield placed over a chase in the joists.

Drilling of Joists

I explained to the man concerned that t.r.s.- and p.v.c.-sheathed cables were also threaded through holes drilled in the joists, but this was not quite suitable for m.i.c.c. cables due to the excessive handling required to pull the cables through the holes, which are normally drilled at an angle. On explaining that the reason for drilling the holes at an angle was the trouble of getting the brace or the drill between the joists, I received the assurance that there was a suitable drill in existence. I personally don't know of such a drill but gather that the aircraft industry uses such apparatus. The apparatus is held vertically but the actual drill or bit is in a horizontal position and, therefore, a straight hole could be made through the joists—or so it is alleged. I imagine that if such a drilling machine were readily available and the price not too high, then it would prove a most useful tool to the contractor. Of course, there is the matter of the drill, or bit, to think of. Many people use the same drill for metal and wood and the standard wood bit is often ignored.

As I have said before, very often these suggestions by people outside the industry are worthy of study by those of us who are apt to overlook possible causes of damage and accident because of "familiarity" with them. Anyhow, there is food for thought in these comments of a client more pernickety than usual.

Final Tests

I am becoming increasingly concerned at the number of instances where the "tested and inspected" label has been found to be incorrect. Recently I mentioned a convector which had the flexible cord inserted into the body but not connected to the terminals. Later I met a site foreman who has found similar faults on gear which has been delivered to him bearing the manufacturer's label clearly and properly completed. He recently took delivery of a cubicle switchboard which had been built to specification and, after moving it into position, proceeded to get his cables, etc., connected into the gear. Being a careful type of person he doesn't "take chances," so he tested the connections and found that he was getting a short-circuit between two phases on the board. After investigation, it was found that a steel clamp, normally used for clamping metal together for drilling, etc., had been fixed to one busbar and was touching another. I might add that the clamp was in a position that could not readily be seen and it was only found after dismantling sections of the board.

Another instance mentioned to me was where one s.p. and n. switch was connected to two phases. Unfortunately, the foreman involved was not so careful as the one mentioned above and when the current was switched on a number of sterilizers got rather hotter than they should have done.

The thing which worries me is that we expect such a piece of switchgear to be suitable for fixing into position and connecting up without having to carry a test to ensure that it is, in fact, correctly connected up. Surely the purpose of the maker's label is to show that it has been so tested and found in order.

Knockouts on Sockets

My remarks concerning the knockouts on double-gang sockets (ELECTRICAL TIMES, 2 June, 1960) have been answered with the usual speed and courtesy which I associate with the company concerned. It is all really quite simple. The one-gang units which have double knockouts had originally only one but from experience gained, the socket was redesigned and this catered for the double knockout. The demand for the original socket was so great that the life of the machine tool (a most expensive item, I assure you) was exceeded very quickly so the new design was produced. The double-gang socket has only one knockout on each side and, as it is not so much in demand, the tool is, of course, still good. The double-gang socket is, I believe, being redesigned now but will not be in production for some time yet. When it appears the matter of knockouts will no longer annoy anyone. Meanwhile, if a mounting block (which has been produced by the same firm) is used, I am assured that it provides all the entries required. I am most grateful for the information.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Another Set at Trenton

Bringing the total capacity up to 60 MW, a fourth generating set was officially commissioned at the Trenton power station of the Nova Scotia Power Commission a few days ago. This is a 20 MW machine. Trenton power station is the Commission's main contribution to the inter-provincial grid, for it generates about two-thirds of the power in the eastern network, supplemented by hydro stations. The Commission expects to spend some $6 million this year, a good proportion of which is for the inter-provincial grid connection with New Brunswick now nearing completion. In the western part of the province 30 miles of 69 kV circuit will be added. The Commission also expects that two hydro plants, at Sissiboo and Weymouth Falls, will be in operation before the end of this year, providing a further 15 MW capacity initially and ultimately 25 MW.

Thermo-electric Development

A Montreal firm claims to have developed a material that makes thermo-electric refrigeration economical. Called "Neelium," the new material is made of bismuth, tellurium, selenium and antimony. The firm involved, Needeo Nucleonic Electric Equipment and Development Co., are now stated to be erecting a mass-production line in 30,000 sq ft of the firm's Montreal plant. Initially it will concentrate on manufacturing thermo-electric devices for cooling electronic gear, but by the end of this year it is estimated that the cost of "Neelium" elements will be low enough to permit their use in commercial refrigerators and perhaps domestic models.

Columbia Talks Unsettled

Although it is understood that the Canadian and US negotiators made some headway on the Columbia River power development problems during discussions in the past few weeks, it is considered unlikely that a start on the scheme will be possible before the spring of 1961. There are to be further talks between the two parties in Ottawa next week. There had been some hope when the recent talks started that a deal could be struck and approved in Treaty form by the US Senate before the end of the 1960 session—about mid-July. But in those meetings the US negotiators indicated that they did not necessarily accept all the principles laid down in the International Joint Commission report on the Columbia scheme. The principle relating to a 50-50 sharing of Columbia power and the making of this split on a gross basis instead of a net basis are two of the points the US officials have not formally accepted as yet. The US now seem to be arguing that the principles should be interpreted for each specific project. They have also been under pressure to accept the Libby Dam scheme in Montana—which many Canadians do not favour. In any event, before construction can begin, a joint treaty on financing and sharing benefits of harnessing the Columbia River for power must be ratified by the US Congress and Canadian Parliament.

JAMAICA

Island's Expansion

Last year was a period of great development in Jamaica, with new records of productivity and prosperity achieved throughout the island. In this expansion, the Jamaica Public Service Co. has fully participated, for Mr G. W. McDuff, the president, states that operating revenue increased by 14·8% to over $2 million, while unit sales rose by 19·9%. During the year £1,565,212 was spent on new plant facilities, the largest annual expenditure in the history of the company. There were 4,673 new customers connected to the company's system, bringing to 51,573 the total number of consumers served. Net generation totalled 245,000,000 kWh, an increase of 37,000,000 kWh over 1958. The Maggotty hydro-electric plant started operation in December, 1959, adding 6,000 kW to the system capacity. The Hunts Bay unit No. 4, which is geared to supply 15,000 kW, is scheduled for completion in the latter part of this year. Progress was also made towards the standardisation of frequency to 50 cycles. The Port Antonio area, which is not part of the company's interconnected system, was converted at a cost of £6,986. This was financed by the company and will be treated as a pilot scheme for standardisation. Although the Jamaica Public Service Co. is the major supply undertaking in the island, there are also 21 private generating plants in operation. Of these, four are operated by the bauxite companies, 16 by sugar estates and one by the Caribbean Cement Co. Together, these private plants generated 209,000,000 units in 1959, an increase of 34,000,000 over the previous year. In addition there are the Electric Supply Co. of Mandeville, and the newly formed Electricity Authority, which operates in Westmoreland. These two undertakings together sold 312,000,000 units last year.

MEXICO

Swedish Contribution

The Stockholm firm of Widmark and Platzer is to take part in the construction of two large power plants in Mexico. One of the new stations, Infernillo, will be Mexico's largest power plant with a rating of 500 MW. It is to be built on Rio Balsas in the State of Michoacán some 80 kilometres from the Pacific coast. The other, Santa Rosa, will be of 60 MW and is to be located on Rio Santiago, 50 km north of the city of Guadalajara. Widmark and Platzer have been engaged by the Mexican contractors on a joint venture and will be responsible for the technical service for underground excavations, including tunnels and machine halls.

SWITZERLAND

All-electric Railways

The whole of the 3,639 miles network of the Swiss Federal Railways has now been electrified. The final section was completed last week with the opening of a service of electrically driven trains on the 20 mile long line linking Cadenazzo and Luino, in the Ticino canton. At the same time the Italian Railways inaugurated the newly electrified route from Luino to Arona and Novaro, bringing into service a second electrified line from Switzerland to Genoa.

CZECHOSLOVAKIA

Increased Production

Although production of most durable consumer goods by Czechoslovakia showed a modest increase last year, compared with the previous 12 months, production of electric washing machines for the period dropped by over 16,000 to less than 300,000. Production of refrigerators increased from nearly 80,000 to over 103,000 in the same period, and television set production rose 50% to 196,000. This indication of an increase in living standards in Czechoslovakia is also confirmed by a rise of 11% in electricity generated,

to over 21,000 million units in 1959. But generating capacity was not increased by the 520 MW planned—only some four-fifths of which was added.

RHODESIA

Talks on Finance

Methods of financing the second stage of the Kariba hydro-electric project are to be discussed by officials of the Federation of Rhodesia and Nyasaland within the next few months. Afterwards, it is likely that an approach will be made to the World Bank. The latter provided £28·6 million of the estimated £80 million required for the first stage of the project.

INDIA

Power Plans

Kashmir is to build two more power stations to produce an aggregate of about 150 MW, according to a recent pronouncement by the Premier. This would be part of a Five-year Plan during which the State will enter the industrial era. A number of industries are being planned to utilise rich resources of lignite and coal in the State.

Future Estimates

The National Council of Applied Economic Research has assessed that India's requirement of energy will rise by nearly 375% in the next 15 years. It has estimated that by 1975-76, nuclear power will constitute about 9% of power generated in the country. Compared with 1950, the primary energy consumption is expected to increase by more than 600% in 1975. This is the measure of expected industrial and economic growth. The council has come to the conclusion that India's energy economy in 1975 will be substantially a coal-based economy and even by A.D. 2000 it will have a high proportion of coal, that is about 55 to 60%. The average rate of increase in total energy will be of the order of 5% per annum, but that of primary energy will be about 10%. During the second and third Plans, the rate of growth is expected to be much higher—about 16% and 12%, respectively.

Bhakra Progress

The first 90 MW generating unit in the left bank power house of the Bhakra dam is likely to be commissioned by October this year. The remaining four units, each of 90,000 kW, will also be completed by April, 1961.

The work on the power house is at present in an advanced stage. The turbines, generators, transformers for the substation and an electrical workshop are more or less ready. The other units at the Kotla and Ganguwal power houses, which are located on the Nangal hydro channel, will also be completed between January and April, 1961. The installed capacity of the Bhakra-Nangal power houses will then increase from 96,000 kW to 604,000 kW in April, 1961. The Bhakra transmission system, spread over Punjab and Rajasthan, is also almost ready. About 925 miles of lines of 66 kV and above have been erected in Punjab and about 150 miles in Rajasthan.

AUSTRALIA

Loan Funds

In publicising a new £3 million cash and conversion loan a few days ago, Mr W. H. Connolly, chairman, announced that the Victoria Electricity Commission plans to spend £29 million on new capital works in 1960-61. The Commission raises about two-thirds of its capital for new works through public loans and the remainder from revenue.

Snowy Scheme

Marking another stage in progress on the Snowy Mountains hydro-electric scheme, a 10¼-mile long tunnel from the new Tantangara dam, on the Upper Murrumbidgee, to Lake Eucumbene was completed a few days ago. The tunnelling job, working from both ends, was completed in 23 months—ten weeks ahead of schedule. The Tantangara dam was completed in February, six months ahead of the time laid down in the contract. Water now being stored in it will be diverted through the new tunnel into Lake Eucumbene, the largest storage of the scheme. Through the tunnel, Tantangara dam will provide a quarter of the water needed for use by the power stations being built on the Tumut River. Thus, water from the Murrumbidgee will cross the dividing ranges twice—first through the new tunnel into Lake Eucumbene and then through another tunnel into the Tumut—before returning through the Tumut into the Murrumbidgee near Gundagai.

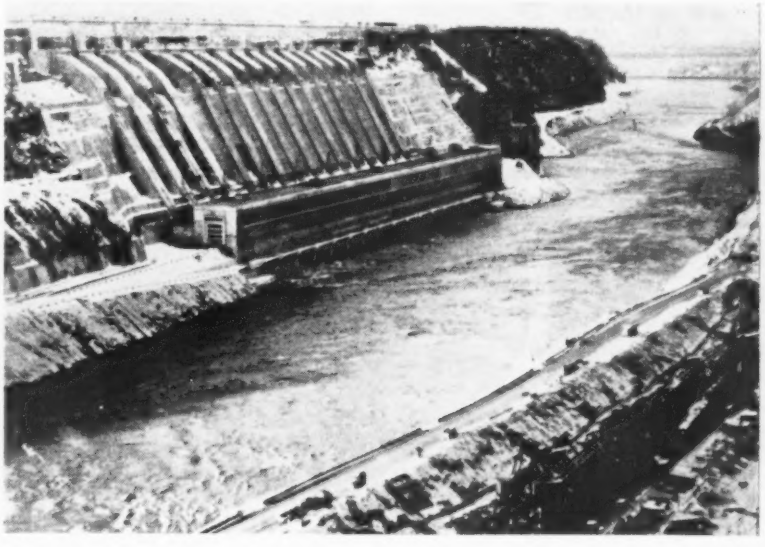
Mt. Isa Station

Final testing of the turbines at Mt. Isa Mines' new power station at Mica Creek, Queensland, has started. It is expected that the plant will be in full operation within the next few weeks. The power station will generate 30 MW, which will be doubled when a second unit is introduced next year. As well as easing Mt. Isa Mines' own power problems, the plant will assist in supplying electricity to the townships of Mt. Isa and Cloncurry.

JAPAN

Transistor Production

Indication of the competition facing British manufacturers is the news that Japan produced 8,000,000 radio sets last year, of which approximately 80% were transistor radios. The total is expected to increase to more than 10,000,000 sets this year. More than 70% of Japan's transistor radios are shipped abroad, mainly to US markets and, although they have prospered there in the past, opposition is being mounted to stop the increased importation.



Scheduled for operation next February, the new Niagara hydro-electric project on the US side of the Falls is rapidly nearing completion, as our picture alongside indicates. Rockwork on the delivery end of the twin conduits is almost finished. The station, with an installed capacity of 2,190 MW, will have a firm power output of 1,700 MW under the most adverse combination of peak daily power demand and low river flow. It will replace the Schoellkopf power station near the Falls, partially destroyed by a landslide in 1956. Since then the north western New York state has purchased substantial amounts of power from Canada. Much of the work on this $720 million project has gone into the construction of the parallel conduits designed to carry water round the "honeymoon" Falls and through two generating plants—the Niagara and Tuscarora pumped-storage station. The latter will pump night-time diversion water into a 45,000 acre-foot capacity reservoir for subsequent use by the two stations. The new Niagara plant will be operated by the New York State Power Authority

In the Honours List

W. H. McFadzean (Kt.)

B. F. J. Schonland (Kt.)

C. R. King (K.B.E.)

A WIDE selection of representatives of many sections of the Electrical industry appeared in the Queen's Birthday Honours List announced last week-end. Pride of place must go to three new Knighthoods, awarded to **Mr W. H. McFadzean,** C.A., COMPANION I.E.E., chairman and managing director British Insulated Callender's Cables Ltd., who is also president of the Federation of British Industries and vice-president of the BEPC; to **Dr B. F. J. Schonland,** C.B.E., F.R.S., director, Research Group, UK Atomic Energy Authority, and to **Dr G. B. B. M. Sutherland,** M.A., PH.D., D.SC., F.R.S., director of the National Physical Laboratory. **Mr F. J. Erroll,** M.A., M.I.E.E., A.M.I.MECH.E., M.P. for Altrincham and Sale, and Minister of State, Board of Trade, is made a Privy Councillor. To **Dr J. S. McPetrie,** PH.D., D.SC., M.I.E.E., director-general of Electronics Research and Development at the Ministry of Aviation, goes the C.B., and **Mr A. F. Williams,** assistant secretary, Ministry of Power, gets the C.M.G.

We also warmly welcome the award of the K.B.E. to **Mr C. R. King,** C.B.E., the indefatigable chairman of the Electricity Council who has played a prominent part in the electricity supply industry over the past 30 years.

C.B.E.

Among those who receive the C.B.E. are **Dr T. E. Allibone,** PH.D., D.SC., F.R.S., M.I.E.E., F.AMER.I.E.E., F.INST.P., director of the Research Laboratories of Associated Electrical Industries Ltd. at Aldermaston; **Mr H. J. G. Grisewood,** chief assistant to the Director-General of the BBC; **Mr H. S. Keep,** assistant chief engineer, Ministry of Transport; **Mr C. T. Meredith,** director of contracts, GPO; **Dr R. A. Smith,** M.A., PH.D., A.M.I.E.E., chief scientific officer, Royal Radar Establishment, Ministry of Aviation; and **Mr J. C. C. Stewart,** deputy managing director (operation), Production Group, UK Atomic Energy Authority.

O.B.E.

Those who receive the O.B.E. include **Mr F. W. Bates,** works director, Kelvin and Hughes Ltd., Barkingside; **Dr L. F. Broadway,** B.SC., PH.D., A.M.I.E.E., head of the Research Laboratories, Electric and Musical Industries Ltd., Hayes; **Prof A. L. Cullen,** PH.D., B.SC.(ENG.), M.I.E.E., professor of electrical engineering at University of Sheffield; **Mr A. A. Smales,** deputy chief scientist, Atomic Energy Establishment, Harwell; **Mr F. J. D. Taylor,** M.B.E., B.SC.(ENG.), M.I.E.E., staff engineer, Research Station, GPO; **Mr F. Wood,** telephone manager, Leeds; and **Mr R. J. Clayton,** A.M.I.E.E., manager, Applied Electronics Laboratories, General Electric Co.

M.B.E.

Among recipients of the M.B.E. are: **Mr C. Boorman,** research manager, Capenhurst Works, Development and Engineering Group, UKAEA; **Mr J. H. T. Borland,** chief designer, Glenfield and Kennedy Ltd.; **Mr A. J. Buxton,** senior executive officer, Ministry of Power; **Mr W. J. Crooks,** production manager to Aberdare Cables Ltd.; **Mr J. C. Gillott,** M.I.B.A.E., lately assistant chief commercial officer, East Midlands Electricity Board; **Mr A. R. Hill,** higher executive officer, GPO; **Mr K. G. Lloyd,** chief export estimator, John Thompson Water Tube Boilers Ltd.; **Mr E. G. Longman,** executive director, Hoffman Manufacturing Co. Ltd.; **Mr R. McGlashen,** A.M.I.E.E., assistant commercial officer (industrial engineer), South of Scotland Electricity Board; **Mr D. A. Neill,** director of Smart and Brown (Engineers) Ltd.; **Mr F. J. Perkins,** higher executive officer, Ministry of Power; **Mr J. H. A. Pugh,** assistant engineer, London Telecommunications Region, GPO; **Mr M. G. Smith,** divisional manager, Mechanical Automation Division, Elliott Brothers (London) Ltd.; **Mr S. H. Tombs,** director and general manager, Globalite Industries Ltd.; **Mr C. V. Waddell,** electrical engineer to Cowans Sheldon and Co., of Carlisle; **Mr J. R. Wight,** electrical manager of Scott's Shipbuilding and Engineering Co., Greenock; and to **Mr H. Denman,** technical representative of Moor Woods Ltd.

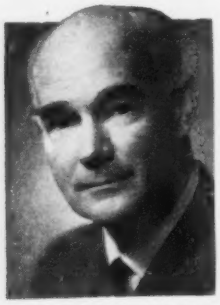
B.E.M.

In the lengthy list of recipients of the B.E.M. we note the names of **Mr A. C. V. Baker,** foreman of model shop, EMI Electronics Ltd., Greenford; **Mr W. Cheadle,** leading stoker, Chadderton power station; **Mr G. Kennedy,** control engineer, Dalmarnock generating station; **Mr R. H. Owen,** J.P., h.t. linesman, Caernarvon district, Merseyside and North Wales Electricity Board; **Mr W. A. Reeves,** substation attendant, Boston, East Midlands Electricity Board; **Mr G. A. Stewardson,** chargehand jointer, e.h.t., with the North Western Electricity Board, Manchester; **Mr G. Trantham,** general foreman, AEI-Hotpoint Ltd., at Llandudno Junction; and **Mr J. E. Tweddell,** chargeman, A. Reyrolle, and **Mr G. Baker,** of AEI Turbine Factory, Rugby.

Overseas

In the overseas awards the O.B.E. goes to **Mr J. H. Sumner,** M.SC.TECH., M.I.E.E., chief hydro development engineer to the Central Electricity Board of Malaya; to **Mr C. J. Fenton,** M.B.E., director of Posts and Telegraphs, North Borneo, and to **Mr J. C. Harrison,** director of Posts and Telegraphs, Victoria, Australia; while the M.B.E. is awarded to **Mr C. S. Cassidy,** electrical engineer, in charge of power and water supply at Maseru, the capital of Basutoland.

J. S. McPetrie (C.B.)



T. E. Allibone (C.B.E.)

L. F. Broadway (O.B.E.)

R. J. Clayton (O.B.E.)

R. McGlashen (M.B.E.)

Personalities *in the industry*

The new district manager for the Essex suburban district of the London Electricity Board is to be **Mr H. V. Billing,** ASSOCIATE I.E.E., who has been district engineer of the board's West Bourne district since its formation in October, 1957. Earlier, Mr Billing was a section head in the sub-area operation and maintenance branch of the Western sub-area. He takes up his new duties on 1 July (*ESH, pages 77 and 79).

Mr Raymond V. Ely, M.I.E.E., M.I.MECH.E., has resigned from the boards of Lancashire Dynamo Holdings and its subsidiaries, Foster Transformers Ltd. and Foster Electrical Supplies Ltd. Since July, 1956, Mr Ely has been group research director of Lancashire Dynamo Holdings when he relinquished the position of managing director of Foster Transformers and Foster Electrical Supplies, although continuing as a director of those concerns.

Chief commercial officer of the Southern Electricity Board since its formation in 1948, **Mr W. B. Poulter,** has been appointed a member of that board, while continuing to serve as a full-time officer. (*ESH, page 91.) Before nationalisation of the electricity supply industry, Mr Poulter was commercial manager of the Metropolitan Electric Supply Co. Ltd. for ten years, following two years as sales, service and development superintendent.

Four new representatives have been appointed to the Sofono Electrical Division of Federated Foundries Ltd. **Mr C. H. Tozer** in the south east; **Mr N. F. Kirkland** in the London and eastern counties; **Mr F. R. Carpenter** in the Midlands and **Mr A. Hilton** in the north.

Mr S. F. Steward, director of BEAMA, is to represent the British Electrical Manufacturing Industry in the first joint broadcast to be arranged by the BBC German service and the Austrian Radio. Subject of the broadcast will be Anglo-Austrian trade and the problems of the "Six" and the "Seven." It will be broadcast by the BBC German service on the evening of 26 June.

British Insulated Callender's Cables Ltd. have appointed **Mr B. Hollingworth,** A.M.I.E.E., A.M.A.M.E.M.E., to the position of assistant sales manager (mining) in succession to **Mr J. A. Rodgers,** who is now Divisional Sales Manager (Accessories). Educated at King Henry VIII School, Coventry, and the North Staffordshire Technical College, Stoke-on-Trent, Mr Hollingworth served a five-year electrical engineering apprenticeship with Parkhouse Colliery Co. Ltd., followed by three years' military service in the Royal Engineers and RAEC. He joined the Wiring Development Department of BICC in 1950 and was appointed mining sales engineer in 1953, responsible for the territory covered by the North East Division of the National Coal Board. He remained in this post until his present appointment.

Mr A. N. Irens, M.SC., M.I.E.E., chairman of the South Western Electricity Board, and **Mr S. Roberts,** chairman of Hoover Ltd., were offered, and have accepted, Fellowship of the British Institute of Management.

Mr A. H. Woodley has been appointed to the board of Keith Blackman in place of **Mr G. S. Teggin,** who has retired owing to advancing age.

The Aluminium Development Association announces that **General Sir Geoffrey Bourne,** K.C.B., K.B.E., C.M.G., has been appointed Director-General to succeed **Air Commodore W. Helmore,** C.B.E., who recently retired after 14 years as Director-General of the association.

Nearly 60 years' service to the electrical industry and his own golden jubilee with Allen West and Co. Ltd. were completed last week by **Mr Victor Breeze,** managing director of the company for the past 27 years. After gaining all-round experience with the British Thomson-Houston Co. Ltd. at Rugby, Mr Breeze joined Allen West and Co. Ltd. shortly after it was incorporated on April 15, 1910. Both as engineer and executive, he has guided the company's progress from modest beginnings to its present proud position as one of the largest manufacturers of electric motor control gear. A member of the Allen West board since May, 1920, Mr Breeze has taken a leading part also in the development of the company's South African and Rhodesian subsidiaries. As a director of Allenwest SA (Pty.) Ltd. and Allenwest Rhodesia (Pvt.) Ltd., he has made many business trips to South Africa. A cockney, Mr Breeze was born at Stratford and was 17 years of age when he went to BTH. He was there for some seven or eight years before joining the Allen West Co. as a draughtsman. After only a short time in the drawing office, however, he was made assistant manager. To mark his remarkable record, the company has presented him with a stereophonic record player, the board of directors paid their personal tribute with a large silver cigarette casket, the foremen's gift was an inscribed silver salver, and the apprentices contributed an inscribed table lamp. In addition, the directors and staff of Allenwest South Africa (Pty.) presented him with an atmospheric clock.

Mr A. S. Brack, who formerly held a senior position in the Glass-fibre Sales Department of Turner Brothers Asbestos Co. Ltd., has been appointed plastics representative for northern England to the company.

We are now able to reproduce, below, the portrait of **Mr Arthur Clark** whose appointment as a director of the British Driver-Harris Co. Ltd. we reported last week. Since 1954 Mr Clark has been general manager of the company.

The Southern Project Group of the CEGB announces the following appointments: **Mr L. W. G. Mason,** A.M.I.MECH.E., has been appointed resident site engineer for the board's fifth nuclear power station, to be built at Dungeness in Kent. Mr Mason, who joined the electricity supply industry in 1932, was formerly resident site engineer for Northfleet and before that held a similar post at Brighton B power station. **Mr M. V. Horsfield,** A.M.I.E.E., has been appointed resident site engineer for Belvedere power station. Mr Horsfield was formerly senior assistant (co-ordination) engineer for both Belvedere and Northfleet. He entered the supply industry in 1929 and served with the Kingston upon Thames Corporation Electricity Department until 1938 when he embarked for India to take up an appointment with the Gourepore Electricity Supply Co. He returned to England in 1949 and worked with the South Eastern Division until 1951 when he joined Messrs Preece, Cardew and Rider as resident site engineer for East

Mr B. Hollingworth

Mr V. Breeze

Mr Arthur Clark

Yelland power station. Mr Horsfield rejoined the then Central Electricity Authority in 1955 and from 1956 until he transferred to the Southern Project Group in 1958 was a senior assistant engineer in the construction department of the London Division. **Mr A. Hanlon,** A.M.I.E.E., A.M.I.MECH.E., has been appointed resident site engineer for Northfleet power station. He formerly held a similar position at Belvedere. He entered the electricity supply industry in 1945 as a graduate trainee in the Birmingham Corporation Electricity Supply Department. In 1948 he joined the Southern Division of the then BEA and later in 1950 served with the London Division. He was appointed resident site engineer for Belvedere in 1957 and transferred to the Southern Project Group in 1958. **Mr S. F. Mogridge,** A.M.I.MECH.E., has been appointed resident site engineer at Bankside B power station. He formerly held a similar post at South Denes, and joined the London Division of the then BEA in 1949. He was appointed resident site engineer for South Denes in 1958. (*ESH, page 51.)

Mr E. T. Williams has joined Crypton Equipment Ltd. as sales promotion manager. He was formerly publicity manager of David Brown Industries Ltd.

Mr H. I. Matthey has been appointed to the board as chairman of Ship Carbon Co. of Great Britain in succession to **Mr A. L. Stock** who has resigned from the board. **Mr R. S. Silman** has been appointed managing director in place of **Mr J. S. Woods** who has relinquished the post. **Mr A. W. Edward** and **Mr I. W. Smith** have been appointed directors of the company.

Mr E. D. Way has been appointed electrical manager of J. Samuel White and Co. Ltd., in succession to **Mr H. G. Cameron** who has retired after holding that position for 32 years. Mr Way joined the company as an electrical apprentice in 1928 and during the ensuing years he obtained a wide experience of all aspects of the installation of marine electrical equipment. From 1937 he was responsible for the electrical side of the many hundreds of small craft built by the company. In June, 1957, he was promoted to assistant electrical manager since when he has also been concerned with the fitting out and trials of many vessels for the Admiralty and foreign governments.

Manager of the March (Cambs) branch of the Eastern Electricity Board, **Mr W. H. Dixon,** M.B.E., has been appointed manager of the board's new Isle branch formed by the amalgamation of the March, Chatteris and Wisbech branches. He will have his headquarters at Wisbech. In 1927 Mr Dixon became the first resident manager at March to the former Beds, Cambs and Hunts Electricity Co., and he continued in that capacity after vesting day.

**Denotes revision to the "Electricity Supply Handbook, 1960."*

On his retirement from the post of export director of BEAMA, after 22 years' service with the association, Mr D. Maxwell Buist was recently presented by the staff with a deep-sea fishing outfit. The presentation was made by Mr S. F. Steward, director, left.

Mr A. E. Crook, C.B.E., who has been elected president of the Association of Mining, Electrical and Mechanical Engineers for the 1960-61 session, is chief engineer (production) to the National Coal Board. Mr Crook was the first Inspector of Mechanical Engineering in Mines, a post to which he was appointed in 1944.

Mr C. G. Willett, divisional administrative officer of the East Midlands Division, CEGB, was last week presented with a refrigerator, subscribed for by colleagues, to mark his retirement after 31 years in the industry. The presentation was made by **Mr O. S. Woods,** M.I.MECH.E., M.I.E.E., M.INST.F., controller of the division (*ESH, page 68). Mr Willett became secretary of the East Midlands Division in 1948, and was previously chief wayleave officer, Central England, with the former CEB.

Dr D. M. McDonald has relinquished his appointment as managing director of Birmingham Sound Reproducers, but will continue to act as chairman. **Mr W. L. Hewitt** has been appointed managing director. **Mr A. M. McOwan** has been appointed a local director of the company's factory in Londonderry. **Mr N. Lane** and **Mr E. L. Wallis** have been made executive directors of the company.

Mr A. E. Farmer, M.SC., M.I.MECH.E., M.I.E.E., has recently retired from his appointment as project engineer, Midlands Project Group, after 35 years' service in the Industry. (*ESH, page 52.) At a gathering held at the Midlands Project Group headquarters tributes to Mr Farmer's service were paid by Mr R. R. Maddock, chief project engineer, Mr F. W. Skelcher, Divisional controller, Midlands Division, Mr G. F. Peirson, deputy chairman, Midlands Electricity Board, and many past and present colleagues. A cheque to purchase a picture was presented to him. Mr Farmer has spent most of his service on building power stations and has been responsible for and closely associated with major constructional works at Walsall, Ocker Hill, Ironbridge, Wolverhampton, Hams Hall and Rugeley. From 1948 to 1958, Mr Farmer was generation engineer (construction) with the Midlands Division, CEGB, and prior to vesting day was construction engineer and technical assistant to the West Midlands Joint Electricity Authority.

Mr D. E. Mutch, Mr E. W. Summers and **Mr C. W. Waldron** have been appointed to the board of Courtney Pope (Electrical) Ltd.

At the annual general meeting of the Telecommunication Engineering and Manufacturing Association **Mr R. A. Moir,** O.B.E., M.C., director of Standard Telephones and Cables Ltd., was elected chairman of the association and **Mr W. F. Oakley,** director of Automatic Telephone and Electric Co. Ltd., was elected vice-chairman.

OBITUARY

Mr R. J. O. Crawford, A.M.I.E.E., chief electrical engineer to the Chesterfield Tube Co. Ltd., has died, aged 65.

Mr J. H. White, a managing director of Bird and Co. (Private) Ltd., of Calcutta, who are managing agents for Indian electricity supply concerns, died on 12 June, aged 49.

BRITISH STANDARDS

Magnetic Tape Sound Recording and Reproduction. *BS 1568 : 1960. Price 4s 6d.* A revision of BS 1568:1953, this now incorporates BS 2478:1954 which has been withdrawn. It deals with magnetic tapes for sound recording which are coated on one side only and covers single-track and twin-track recordings, both for professional and entertainment uses.

Rubber Gloves for Electrical Purposes. *BS 697 : 1960. Price 5s.* A revision of the 1953 edition, the main change is in the title since it was felt that the original one, "Electrician's Rubber Gloves," implied restriction of usage. Strictly speaking, only gloves for use on voltages not exceeding 650 V are equipment for electricians, since Electricity Regulations under the Factories Acts prohibit the working on live lines above this voltage. The standard covers three classes of gloves rated at 1,100, 3,300 and 4,000 V which are for use where the regulations do not apply for saving life. An appendix gives useful advice on the maintenance of gloves after purchase.

Aluminium Alloy Conductors for Overhead Power Transmission. *BS 3242 : 1960. Price 4s 6d.* A new publication which has been prepared in collaboration with organisations concerned in the manufacture and installation of stranded aluminium alloy conductors. This must not be confused with the s.c.a. conductors (*BS 215*), but relates specifically to stranded cables made from heat-treated aluminium-magnesium-silicon alloy wires.

Nuclear station for N. Ireland ?

IN presenting the annual report of the Electricity Board of Northern Ireland at Belfast on 9 June, Major James Walker, the chairman, made reference to the possibilities of a nuclear power station in the board's area in the future. Investigations had been taking place into the suitability of a number of sites but it was too early to say whether any of them were acceptable or whether it was likely to become a considered proposition. There were two schools of thought. One believed that the capital costs would be too high; the other felt that within the next few years the cost of nuclear generated power might be less than that produced in a conventional fuel-fired station. But, he said, the future of electricity supplies in Northern Ireland must eventually lie in a nuclear station.

Rural electrification

During 1959 a further 4,825 rural premises had been connected up at a cost of £641,022, bringing the total number of rural consumers in the area now up to 83,958. New connections in the year, at around £133 per consumer, compared with 4,763 in 1958 at a cost of £787,945, or £165 10s per consumer. Rural consumers last year included 21,027 farms—an increase of 1,883—who were responsible for the consumption of 79·803 million units as compared with 12·756 million in 1951 and 78 million for the whole of the board's consumers in its first year of operations, 1932. In the last ten years an average of 151 farms per month had been connected, but the board could not afford to go on losing money on farms where the guarantee, even at 19%, did not give a reasonable return and there would always be the remote case where such conditions would arise.

Consumption and rates

During the year a total of 612·49 million units were sold, an increase of 9·2% over 1958 and, during the period, the average price per unit fell 0·02d to 2·07d. Gross revenue was £5·35 million as compared with £4·946 million in 1958. The balance on the year's working was £46,594. Major Walker mentioned the surprise that had been expressed by many delegates at the BEPC when told the prices at which the board were supplying current in Northern Ireland as compared with the prices for rural supplies in Great Britain. He then went on to announce further reductions in tariffs and minimum annual guarantees for the coming year. For large consumers the reduction was by raising the basic price in the coal clause from 65s to 70s per ton and also by reducing the unit charge per shilling per ton, by which the actual coal cost exceeded the new basic price, from 0·01d to 0·009d. This was estimated to save the consumers some £200,000—or 4%—on their electricity bills as from January, 1960.

For rural consumers, from the same date, the minimum annual guarantee had been lowered from 22½% to 19% of the estimated capital expenditure on the connection, a helpful reduction. On this basis the board were not making ends meet on rural supplies, but they were carrying the deficit on other sections of the undertaking until such time as demand felt the stimulus on new extensions.

From the end of the first quarter in 1960 supplies restricted wholly to off-peak periods had been reduced from 1d to ½d per unit and the hours of restriction had also been reduced to 7.30 a.m.-12.30 p.m. and 2.30 p.m.-6.30 p.m. Monday to Friday throughout the year. It was hoped that this concession would stimulate the use of electricity during these periods by the extension of such applications as domestic under-floor warming, domestic, industrial and commercial water heating, agricultural soil heating, battery charging, trade cooking and baker's ovens, tar heating and other process purposes.

The board was aware that these reductions would come under fire from critics but, by reducing tariffs and guarantees, they were taking a business risk and felt that it was their duty to users, and the public, as a whole, would find that the new prices would make electricity competitive with other forms of fuel.

Coolkeeragh power station

The first 30 MW set at the new power station at Coolkeeragh is now undergoing pre-commissioning to be followed by a second 30 MW set in the next few weeks and a 60 MW set by 1961. This is the first of the board's generating stations to be oil-fired and, being situated adjacent to the new industrial projects of Du Pont Chemicals and Carbide Industries, will provide all their power requirements and additional supplies of steam, demineralised water and sea water as well as the present and future requirements of Londonderry when the existing stations are closed down. It will be connected by 110 kV overhead lines with the other major power stations in Northern Ireland. The site is capable of development up to a total capacity of 360 MW.

Sensitive Stop for Looms

A NEW type of thermionic valve control panel has been fitted to two carpet looms at T. F. Firth and Sons Ltd., Brighouse. It operates to stop the loom immediately any of the fibres break and so avoids the production of faulty material.

Previous system

Two disadvantages which occurred with the old control system are overcome in the new panel. Previously, feelers in a circuit operated by the yarn touched when the yarn broke and operated a relay to give an alarm and stop the loom. Because sufficient power was required in the feeler circuit to operate directly a relay, it was possible for an arc to be maintained which could ignite the yarn and cause a fire. In addition, because of the low level of voltage used and the magnitude of the relay minimum operating current, grease and dirt on the feelers could cause a failure to indicate a breakage of yarn even when the feelers were apparently making contact.

The electronic system was developed and installed by Westool Ltd., St. Helen's Auckland, Co. Durham, to overcome these two difficulties. The system of operation is by means of a detection relay connected in the common supply to a number of triode valves, and alarm indication lamps connected in series with individual valves. A large negative bias voltage is applied to the control grids of the valves, thus preventing the flow of current through the relay and lamps. When a yarn breaks, the feelers come together and short out the bias to their own particular valve control grid thus causing the relay to become energised and the particular alarm lamp to glow. The detector relay in turn energises a control relay, which stops the loom and lights a main alarm lamp, and also latches itself in so that when a fault has been recorded a reset button must be pressed before the machine can be started again.

Low current

Since the feelers are now used in the control grid circuit of thermionic valves, the power level required is very low, and although a much higher voltage can be applied to overcome dirty feeler contacts it is possible to include high value resistors in the circuit to maintain the maximum possible current to the low safe value of 0·4 mA. The additional cost of the thermionic valves is compensated for by the fact that two relays only are required, one detector and one control, as against one per stop motion under the old scheme. Since the valves are normally biased to zero current, extremely long service life can be expected.

Open day at Portishead "B"

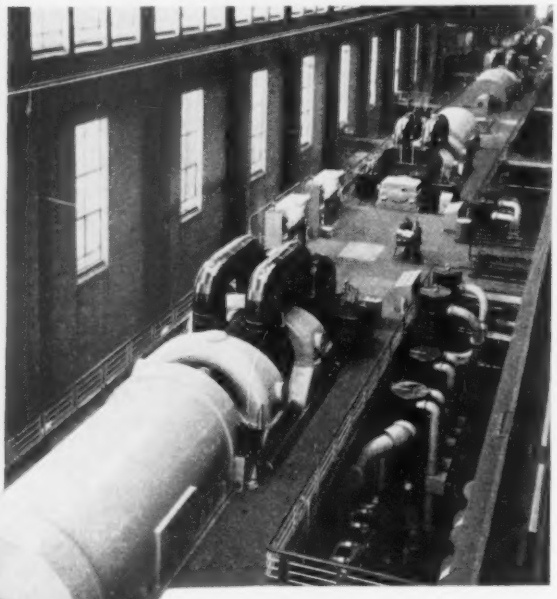
CIVIC VISIT TO THE COMPLETED POWER STATION

ON Friday, 10 June, civic authorities and guests were invited to an open day at Portishead "B" power station, Bristol. In honour of the occasion, an attractive booklet giving both historical and technical information, which will be valued by all who receive it, has been prepared for the South Western Division of the Board.

Portishead "B" was actually completed with the commissioning of the last of the six 60 MW turbo-alternators (now up-rated to 65 MW) in December last year. All that remained was the clearing up of the site and buildings. The project was started in May, 1949, and, with the commissioning of the first alternator in 1955, became the third new station to be commissioned in the S.W. Division since nationalisation. The total output was planned to be 360 MW from six AEI (Metropolitan-Vickers) turbo-alternators but, during the progress of construction, it was found possible to up-rate all the machines to give 390 MW.

Each turbine is served by two Mitchell boilers with an evaporative capacity of 300,000 lb/hr at 950 lb/sq in. and 925°F superheat. Six of these are for pulverised fuel, two are fired by either oil or p.f. and the remaining four are oil fired but arranged for conversion to p.f. at a later date. The estimated time for converting or changing over is said to be about 14 days. The p.f. mills and firing equipment are by International Combustion Ltd. Coal bunkerage capacity is given as 60,000 tons and oil storage, in two tanks, is 22,400 tons. Oil firing equipment is supplied by Fuel Firing Ltd.

The 90,000 s.h.p. two-cylinder AEI (Metropolitan-Vickers) turbines are each coupled to a 66 MW, 11·8 kV hydrogen-cooled alternator. On machines 1-4 the hydrogen pressure is 0·5 p.s.i.; on 5 and 6 it is as high as 15 p.s.i. The alternators, with their turbines, condensers and ancillaries, are installed line-ahead in the 700 ft long by 55 ft wide turbine hall.



View of the turbine hall at Portishead "B", with its six 65 MW turbo-alternators in line-ahead. The hall is 700 ft long

Each alternator is solidly coupled by 1·25 sq in. cables, four per phase, to a 72 MVA generator transformer stepping up to 132 kV for transmission via the grid. On-load tap changing in 14 steps is incorporated. Starting and auxiliary supplies are provided from three 7·5 MVA 33/3·3 kV transformers fed from Portishead "A" but facilities are provided to tap the leads to each generator transformer should there be a shut-down at the "A" station.

An unusual feature at Portishead is the very high tidal range which prevails in the Severn estuary at this point, which has necessitated the cooling water, of which the station needs some 18 million gallons/hr, to be drawn from a dredged channel well out in the estuary through four culverts each of which is about one-third of a mile long. These connect to three 45 ft dia pump pits 79 ft deep in the turbine house, and the invert levels are 37½ ft below datum to ensure that the pumps are naturally primed at lowest tide levels.

The design and construction of the station was carried out under the direction of Mr A. C. Thirtle, A.M.I.C.E., A.M.I.E.E., M.INST.F., then Divisional Controller, SW Division, and he continued to be responsible as project engineer until his retirement in August, 1959. He was assisted by Mr J. Irlam, ASSOCIATE I.E.E., as chief generation engineer. Final stages have been under the direction of Mr H. S. Davidson, T.D., M.I.E.E., assisted by Mr H. E. Vickers, M.I.MECH.E., A.M.I.E.E. Sir Wm. Halcrow and Partners were Civil Engineering Consultants.

Contractors

Apart from the contractors already mentioned, those responsible for the supply of electrical equipment included the following: unit and auxiliary transformers, AEI (Metro-Vick), Bryce Electric Construction, Yorkshire Electric Transformer and South Wales Switchgear; 132 kV switchgear, AEI (Metro-Vick); 3·3 kV and 415 V switchgear, English Electric Co; motor control gear, Brookhirst Switchgear; electric motors, Laurence Scott and Electromotors, AEI (Metro-Vick) and Mather and Platt; control room equipment, AEI (Metro-Vick), English Electric and Automatic Telephone and Electric; cables, British Insulated Callender's Cables; batteries, Chloride Batteries; battery charger, Crypton Equipment; telecommunications, Automatic Telephone and Electric; electrostatic precipitators, Sturtevant Engineering; turbine hall crane, J. M. Henderson.

NEW LITERATURE

Value Engineering

THE term "value engineering" or its alternative, "value analysis," is a new facet of engineering which is broadly summed up by the aim of putting existing products economically within reach of more people; it is something more than merely cheapening products themselves. The philosophy behind this new term, and its practical implementation, is set out in this book, which is a record of all technical papers presented to a conference on value engineering held at the University of Pennsylvania last October by the American Electronic Industries' Association. There are 17 contributors from a variety of industrial and government organisations describing ways in which value engineering has been applied and the success it has achieved. Published by Interscience Publishers, 88 Chancery La, W.C.2. 165 pages, 9 in. by 6 in. Price 45s.

Public Enterprise in Britain

by V. V. Ramanadham, M.COM., PH.D.

ALTHOUGH this economist's study of experience with nationalisation in the UK is concerned with the whole range of nationalised corporations, it draws most of its illustrations from electricity supply. Many of the questions which have been the subject of lively debate within the industry are discussed by Dr Ramanadham in the extensively anotated pages of this small volume. Notable amongst them are self-financing, public accountability allocation of capital, pricing policy, and the possibility of evolving managing and accounting units at below area board level. The aim of the discussions is to expose difficulties and highlight those areas of policy where fully successful practices have not so far been evolved—successful, that is, from the economist's standpoint rather than the sociologist's or the technologist's. With such a standpoint, it is not to be expected that many firm conclusions will be reached: but that does not detract from the value of this study in suggesting new lines of thought on so many important topics. For the engineer it has the advantage of being very fully argued, with much recourse to the shorthand jargon of economics. Amongst the most interesting sections in the light of current developments is the discussion on pricing policy from the aspect that some forms of price discrimination may amount to cross-subsidisation from one geographical region or type of consumer to another. Published by Frank Cass and Co., 176 pages, 8½ in. by 5½ in. Price 21s.

Power Station Engineering and Economy

by B. G. A. Skrotzki and W. A. Vopat

THERE is always room in engineering literature for the book, nominally a text-book, which relates for the student theoretical studies to current practice. The present volume is an excellent example of the type. It assumes a knowledge of thermodynamics and mechanics to undergraduate level, and on that basis surveys the construction and operation of the principal mechanical engineering plant in power stations. Treatment is kept general; the authors exercise nice judgment in giving enough detail to be thoroughly understandable without obscuring the general principles of operation they are establishing with out-of-place minutiae of design. Two features extend the value of the work beyond the classroom; the references and helpful illustrations, and the number of up-to-date examples that are included, though these come from US practice.

Five main sections make up the book and the list of them fixes its scope: energy processing (applied thermodynamics and heat transfer); steam power plants; internal combustion plants; hydro and meteorological plants; and power economics. Of the book's 700 pages of text nearly 300 are concerned with steam plants and 150 with economics. There are separate chapters on subjects of such topical importance as supercritical pressure generation and fuel cells; and a useful reference appendix of materials constants. Published by McGraw-Hill, 751 pages, 9 in. by 6 in. Second edition (first published as "Applied Energy Conversion"). Price 97s.

The Power Team

by C. Cederholm

SWEDEN'S enterprise in erecting the world's first 380 kV transmission system is one of the more exciting engineering stories of recent years. But this work comes at the end of a half century of ambitious electricity planning in a country whose principal resources of power are more than 600 miles from her centres of population. To celebrate the jubilee of the formation of Sweden State Power Board, the present photographic volume has been produced. Its many studies are concerned with people rather than things, but inevitably in the setting of power stations, transmission lines and hydro installations, there is much of technical interest as well as artistic merit. The intention, as the president of the board, Mr E. Grafstrom, makes clear in the foreword to the volume, is to capture something of the atmosphere and activity in which the board's employees do their work. To judge by this English version by Mr A. Blair, that object is successfully achieved. Published by the Swedish State Power Board.

Electronic Computers

by T. E. Ivall

SO much have computers progressed in the last few years that it seems hardly surprising that a new edition of this book should be appearing as soon as four years after the original. It is also a reflection on the extent of computer development that the new book has been radically altered; it has been largely rewritten and most of the diagrams have been altered. Three new chapters have been added, dealing with analogue computer circuits, digital computer programming and the future evolution of more advanced machines. The fundamental approach is unchanged, and the book remains a helpful non-mathematical introduction to computers for those likely to become involved in some specialised aspect of them. Published by Iliffe and Sons, 263 pages, 8½ in. by 5½ in. Second edition, price 25s.

BOOKS RECEIVED

Metal Industry Handbook and Directory, 1960. Metals listed by their general properties, general engineering data and tables, notes on electroplating and allied processes, and a directory to trade names and organisations and societies, and a buyer's guide. Published by Iliffe and Sons Ltd., 568 pages, 8¼ in. by 5¼ in. Price 21s.

High Productivity in Heavy Engineering, by A. G. Thompson. Discusses technology of welded fabrication. Published by Iliffe and Sons Ltd., 339 pages, 8½ in. by 5½ in. Price 65s.

Problems in Electrical Engineering, by S. Parker Smith. Expansions in the latest edition are in the direction of providing more problems in electronic engineering, including a new section on transistors. Published by Constable and Co., 370 pages, 8¾ in. by 5½ in. Seventh edition. Price 20s.

Industrial Electronics and Control, by G. Kloeffler. Text-book for engineering students approaching subject through solid state physics rather than valves. Includes new material on semi-conductors and magnetic amplifiers. Published by Chapman and Hall, 540 pages, 9 in. by 5¾ in. Second edition. Price 80s.

Diffraction Gratings as Measuring Scales, by J. Guild. Based on work carried out as part of diffraction grating research at the NPL, this deals with technical problems of measuring moiré fringes in their application to machine tool control. Published by Oxford University Press, 210 pages, 8½ in. by 5½ in. Price 35s.

Practical Residential Wiring, by J. F. Nowak. Revision of American work on house wiring intended primarily for "do-it-yourself" enthusiasts. Published by D. Van Nostrand, 511 pages, 9 in. by 6 in. Second edition, price 60s.

Theory and Design of Inductance Coils, by V. G. Welsby. Revised edition of book concerned with design principles explained from practical viewpoint. Published by Macdonald and Co., 232 pages, 8½ in. by 5½ in. Second edition, price 30s.

Transformers and Generators for Power Systems, by R. Langlois-Berthelot, translated by Lt-Col H. M. Clarke. Discusses design of these machines in manner appealing to design and system operating engineers and to engineering students. Published by Macdonald and Co., 541 pages, 8½ in. by 5½ in. Price 65s.

Electronic Circuits, Signals and Systems, by S. J. Mason and H. J. Zimmerman. Discusses circuit and system analysis presenting matrix, topological and signal-flow-graph methods. Published by Chapman and Hall, 616 pages, 9 in. by 6 in. Price 100s.

equipment for industry

Silver based coating and cement

HIGH conductivity coupled with tougher and more wear resistant properties than have previously been possible are the features of two new thermo-setting silver preparations. A surface coating preparation, developed for applying by brush or spray and suitable for coating most materials including glass and plastics, forms after curing an extremely hard conducting film, resistant to water and organic solvents. It is designated FSP43. The second introduction is a conducting cement, FSP49, for providing a conducting bond between materials such as glass, graphite and many plastics. Both these materials are Araldite-based and require curing at 80°C. — *Johnson Matthey and Co. Ltd., 73-83 Hatton Garden, London E.C.1.*

Hydraulic crane brake

A SERIES of hydraulic "Perigrip" brake units is now available augmenting the well-known range manufactured by AEI Ltd. The new hydraulic units have been introduced for control of travel motions on overhead cranes, although their controllable braking action will be useful for numerous industrial applications. Instead of the positive "snap" action of the electrical brake, braking force on the hydraulic unit is controlled by an operator's foot pedal so that, on a crane travel motion, any tendency for the load to swing is minimised. The brake is normally off and is applied by a simple oil-operated hydraulic unit. It is available in 8, 10 and 12 in. drum sizes with braking torques up to 400 lb ft. *AEI Ltd., Motor and Control Gear Division, Rugby, Warwickshire.*

Transistor aids temperature checks

IMPROVED techniques using symmetrical transistors as choppers, developed by the aviation division of Smiths, are claimed to overcome earlier objections to the use of transistors for thermocouple work due to their drift. Advantages claimed for the arrangement are that setting up is not required, and that not only is the transistor circuit small and light but that it is also sufficiently robust for industrial uses. Results show that without special selection or setting up drifts of better than 1·5 microvolt/°C can be obtained over temperature ranges from −40° to +100°C using silicon transistors. It is also possible that similar techniques could be used for strain gauge work.—*Smith's Aviation Division, Kelvin House, Wembley Park Drive, Wembley, Middlesex.*

New floodlanterns

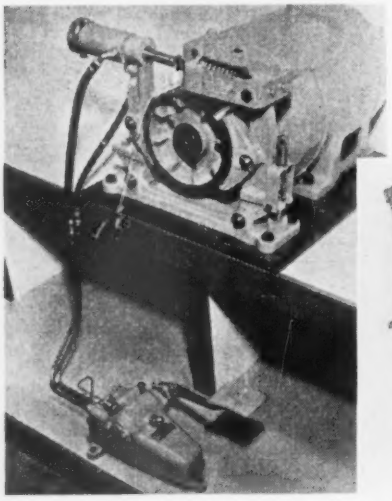
TWO new floodlanterns recently added to their range by REAL are suitable for use with 250/400 W MBF/U colour-corrected mercury lamps. For short or medium range floodlighting the upward lighting model, list No. 1231, is available with a parabolic, asymmetric reflector. The downward lighting fitting has a symmetric parabolic reflector mounted in an adjustable frame which is suitable for attaching to either wall mounting brackets or clamps for pole mounting. This lantern, list No. 1235, is equally suitable for use with 1 kW two-line filament lamps and can be supplied with focusing devices at extra charge. *Rowlands Electrical Accessories Ltd., Hockley Hill, Birmingham 18.*

Transistor techniques

TWO recent additions to the series of application reports published by the Transistor Division of Standard Telephones and Cables contain useful information for circuit designers using transistor techniques. The first report, MK/145, discusses methods of compensating for temperature change in transistor circuitry and describes the relative merits of negative temperature coefficient devices or thermistors and their positive temperature coefficient counterpart, the Silistor. Particular attention is given to problems of cross-over distortion and prevention of thermal runaway in class "B" push-pull amplifiers. Report MK/144 discusses application of transistors in binary counting circuits and analyses the circuits to permit comparison of their relative merits. Performance figures are quoted based on circuits using germanium alloy junction transistors, having a cut-off frequency of about 6 Mc/s. *Standard Telephones and Cables Ltd., Transistor Division, Footscray, Kent.*

Heavy-duty cable ducting

SPECIFICALLY designed for providing air, water or electric services to cranes, machine tools or handling machinery which must operate under heavy-duty industrial conditions, is a type of flexible cable ducting now available. It is composed of steel trough-links with adjacent links coupled by pin-connectors which permit relative angular movement. Sections of the ducting are self-supporting over lengths of 30 ft so that travel of up to 60 ft about a central feed point is possible. Cables or hoses can be laid in the ducting without internal support and it is claimed that, since rolling motion only takes place, there is no friction between the hoses or cables and the ducting walls. *Brookhirst Igranic Ltd., Igranic Works, Bedford.*



The AEI "Perigrip" brake with hydraulic operation developed for crane applications

Two REAL floodlights introduced for use with 250/400 W colour corrected mercury lamps

Below, ducting for carrying air, water or electric services, by Brookhirst-Igranic

for the electrical trade

Mushroom lamps

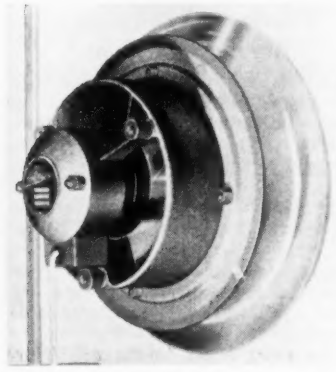
ASCOT LAMPS and Lighting have introduced a mushroom-shaped lamp, the "Diplomat," which will eventually replace the conventional model. This change in design has not altered the prices of these coiled-coil lamps, which sell at 1s 8½d, 1s 11d and 2s 10d for 40/60 W, 75/100 W and 150 W, respectively, including tax. All sizes have twin glass-encased fuses and moulded neck seal. The new lamps are packed in a newly designed patented sleeve with turned-in flaps. *Ascot Lamps and Lighting, Arcola St, E.8.*

Fluorescent price cuts

PRICE reductions in fluorescent lighting fittings are announced by Ekco-Ensign Electric and Atlas Lighting. The "Atlantic" range by Atlas has been cut in price by up to 8%, operative from 15 June, making the most expensive model, a twin diffuser 5 ft fitting, cheaper by 25s 2d. Ekco-Ensign are reducing the whole range of fluorescent fittings. The new prices also take effect on 15 June.

Extractor fan

A NEW extractor fan now available, the "Comet," costs only £6 12s 6d retail. It requires an aperture 8 in. diameter, its 6 in. blade rotating on power from a 25 W shaded pole motor. The exterior of the fan is shielded by a metal cover which will effectively prevent in-draught from wind currents. This fan has self-lubricating bearings and rust-proof alloy construction, finished in white or cream. *Hillman Electric Motors, Crane Grove, Highbury, N.7.*



"Comet," the £6 12s 6d extractor fan by Hillman Electric Motors

Transistorised VHF radios

TRANSISTORISED VHF battery radios, claimed to be the first produced in this country, are announced by Ferguson Radio Corporation. The new circuit, which will be employed also in HMV and Marconiphone receivers, operates on a 9 volt layer type battery with nine transistors, four germanium diodes and two selenium rectifiers. It is equipped with a built-in aerial and connection for external aerials for long-wave, medium wave and VHF reception. A one-watt output stage powers the 8 in. by 5 in. speaker. Other circuit features are bias voltage stabilisation, a ratio detector for improved reception in difficult areas, an additional a.g.c. diode and r.f. amplifier. So far only the price of HMV's model 1421 has been announced. This 19 in. by 13 in. by 17 in. cabinet in sapele and rosewood will retail at £29 8s, tax paid. This price does not include the battery. *Thorn Electrical Industries Ltd., 109 Judd St, W.C.1.*

Restyled dryer

A COMPLETE change of cabinet styling has been adopted by Parnall for the new "Auto-dry" tumbler dryer, Model 59. Unlike its predecessor, TD57 (described on this page in 12 May issue), this model has a flat table top, the controls being shifted to a full-width panel in the top of the front face. It is also slightly higher than the earlier cabinet, which was designed to slide out of sight under wall fixtures. Another major change is in the materials used for construction of the loading door. Instead of metal and glass pressings with a square metal covering door, the drum lens and hinges are now formed from Tyril 767, a tough plastic. There is no covering door. This 2½ kW appliance has automatic timing, three-heat control and two safety devices; a door-operated braking switch and a thermal cut-out. TD 59 is priced £49 10s, including tax. *Electrical Division of Radiation Ltd., 255 North Circular Rd, N.W.10.*

TRADE PUBLICATIONS

E.E.—30-page illustrated reference list on steam turbine plant. List gives details of 10,000 kW machines and alternators ordered between 1920 and 1959 giving customer and location. English Electric Co. Ltd.

WANDLE.—12-page booklet on p.v.c. and polythene insulated wires and flexibles for radio, television and electronic industries. Wandleside Cable Works, 106 Garratt La, Wandsworth, S.W.18.

TELCON.—Pamphlet on Telcleats (Cable Cleats). Eight-page pamphlet on injection moulding equipment for joints in plastic cables. 20-page Guide to handling and installation of Helical Membrane Cables (HMH/1). Eight-page booklet on flare type connectors for use with helical membrane radio frequency cables. Telegraph Construction and Maintenance Co.

SLR.—Lists Nos. 36-40—illustrated price leaflets of decorative lighting fittings. S.L.R. Electric Ltd., 2 Peterborough Rd, Harrow.

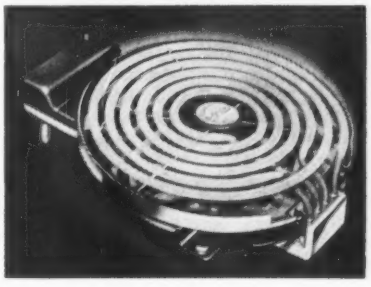
NEWGATE.—Pub. 3504, technical leaflet on a dust collector. Sturtevant Engineering Co., Southern Hse, Cannon St, E.C.4.

MILLET.—New leaflet illustrating the fabrication of various panels for electronic instruments. Millett, Levens (Engravers), Stirling Corner, Boreham Wood, Herts.

HOTPOINT'S HIGHER SPEED COOKER RINGS

A NEW development in the design of radiant cooker element rings giving more rapid heating has been adopted in Hotpoint's high wattage "Halo" models, which replace their old "Torribar" range. The new elements, rated up to 2,300 W, are said to be extremely fast in heating and cooling, these results being achieved by the combination of higher rating and more practical construction of the element rings. Thermal mass of the tubing has been considerably reduced, this and the reduction in diameter are associated in the improved speed. Shape of the elements has been modified to provide a more efficient contact with utensils. "Inconel" tubing is now "D" shaped in cross section, the flat upper edge as well as the increased coil length presenting a larger contact area. In practice the bigger unit will boil a pint of water in 3¼ minutes.

Hotpoint claim to have widened the safety margin by the use of particularly high standard magnesium oxide insulant. Mean leakage current is said to be only 0·3 mA, well below the 10 mA limit stipulated by BS 744. The two sizes, 8 in. and 6¼ in., are supplied complete with an EDA undercarriage. The larger model, AA 800, is rated at 2,300 W, and can be supplied with a single circuit for simmerstat. Single-heat costs £3 18s list; three-heat, £4 6s. AA 625, the 6¼ in. unit with 1,350 W, 580 W and 337 W rating, is also available with alternative simmerstat control connection. List price is £3 15s 3d. "Halo" rings carry a two-year guarantee. *AEI-Hotpoint, 33 Grosvenor Pl, S.W.1.*



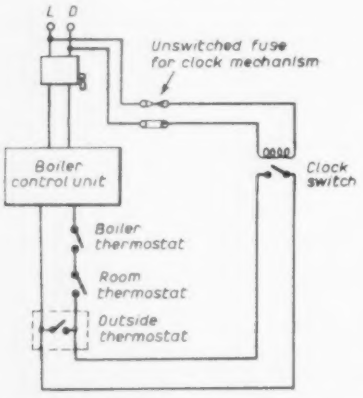
PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to make it easier; all make instructive reading.

Oil-fired Boilers

THE increasingly popular oil-fired equipment is normally wired so that the electrical feed to the control unit is regulated by a time switch to switch-off during the night. The disadvantage of this connection is that, while the thermostat controls the system during the day, it is completely inoperative to combat a really cold spell occurring during the night.

In one of my installations this was overcome by using the circuit shown in the accompanying diagram. It will be noted that, whereas the boiler and room thermostats are wired in series, the outside thermostat and time switch are connected in parallel. The synchronous motor connections in the clock are completely isolated from the boiler control circuit.



An external thermostat in parallel with the time switch contacts guards against the "cold-snap" in an oil-fired heating system

In another oil-fired installation, the supply mains were inadvertently connected across a low voltage coil in the control unit. As can be imagined, a cloud of smoke and a horrible smell of charred insulation gave clear indication that the coil was well beyond repair. As it was late on a Friday afternoon and we had no replacement coil, it seemed that there was little we could do about it. But the client insisted that the unit must be switched on over the week-end, so we decided to have a go at repairing it.

Opening the back of the control unit we carefully removed the burnt-out coil. Back in the workshop we soon found, as we had feared, that no resistance test was possible because of the charred state of the insulation, but we were able to gauge the size of the wire. Fortunately, we were also able to locate wire of this size in a disused television set. It now became a task of counting the turns, which came to the odd number of 311, as we unwound the burnt-out coil. The rest was comparatively simple and, on test, the installation worked perfectly. Our satisfaction at having achieved the apparently impossible was the greater when we realised that we had also saved considerable service charges from the boiler engineers.—*"Michet."*

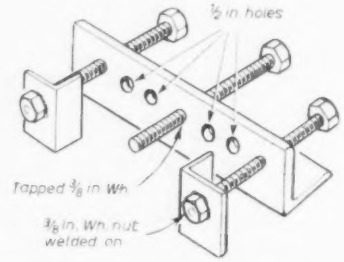
Simple Pulley Extractor

ON a series of erection jobs we had to take off and refit various pulleys on motor driving shafts. Being large pulleys, the jaws of the normal extractor would not extend far enough to withdraw them so I made up a simple extractor out of a short length of angle iron.

In one web, as shown in the sketch, I drilled a row of $\frac{1}{2}$ in. holes with, in the centre, a hole tapped $\frac{3}{8}$ in. Whitworth reinforced at the back by a $\frac{3}{8}$ in. nut welded on for strength. Through the centre hole I screwed a long $\frac{3}{8}$ in. bolt, threaded down to the head, which butted on to the centre of the shaft.

The jaws of this extractor were two pieces of squared angle iron with a $\frac{3}{8}$ in. Whitworth hole, again reinforced by a nut welded on, in one face. These were attached by $\frac{3}{8}$ in. bolts passing through the $\frac{1}{2}$ in. holes in the long angle.

The series of holes enabled the extractor to suit various size pulleys with an extra adjustment by reversing the angle of the jaws. By placing the jaws on the edge of the pulley and tightening down the bolts, the pulley is drawn off its shaft.—*H. Keel.*



A simple pulley extractor for large diameter pulleys made from angle iron

Keeping Wheels Turning

NOT the least of the responsibilities of a maintenance engineer is that of keeping the wheels turning while a fault is being rectified. One occasion I well remember was a complaint from an engineering firm that a motor driving lineshafting was showing a loss of power and the starter was running hot. Inspection showed that the motor was a 40 h.p. slip-ring three-phase induction motor controlled by a floor mounting oil-filled rotor starter in which the face plate was at the bottom with the resistance coils in the oil above. It was certainly very hot indeed and I immediately diagnosed a faulty contact arm or brush—not very difficult in the circumstances. To remove and repair—there was not a replacement handy—would take 4-5 hours, but the lineshaft had to be kept running.

The motor was not fitted with brush short-circuiting gear so I opened up the slip-ring cover and proceeded to wind some stout copper wire across the three terminals effectively short-circuiting them. The motor immediately increased speed under load. The starter was then removed and a notice put on the motor stator switch, "Do not switch off."

In the maintenance workshop the starter was removed from the case and, as expected, one arm, a brass casting, was found to be fractured. A brass plate was cut to size to bridge the fracture, the two parts of the arm were butted together, drilled and attached to the plate. Using a blow-torch and tinman's solder, the whole was then fused together after which the contact studs were cleaned, brushes adjusted and the oil replaced. The starter was then returned to the site and connected up after which the short-circuiting wire was removed.—*"Ion."*

Mysterious Hum

DISCUSSIONS on the subject of mains hum recently brought to mind a mysterious and, as yet, unexplained occurrence some 45 years ago. It was in a house at Thorpe Bay where the supply was 230 volts d.c. In one room when all was quiet and the light was switched on, one could clearly hear the commutator hum of the station generators. Changing the ceiling rose, switch or lamp bulb—they were the "wire cage" type in those days—made no difference, but in no other room, or in any other house in the neighbourhood, could it be heard. Any suggestions?—*"Puzzled."*

News of the Week

FOREIGN REFRIGERATORS: FALSE CLAIMS PROTEST

N. F. T. Saunders, Man. Director Kelvinator

Kelvinator Chief condemns merchandising malpractices for imported 'fridges

MISLEADING claims made for foreign refrigerators distributed in the UK are causing concern in the British refrigeration industry and may lead to possible action at official level to regularise merchandising and advertising practices in respect of imported appliances if importers continue to make false claims.

Instances of such malpractices are referred to by Mr N. F. T. Saunders, managing director of Kelvinator Ltd., in a letter published last week in the *Financial Times*.

"Some imported refrigerators are being advertised and sold in the UK in a manner deliberately designed to convey the impression that they are made in this country," he points out. "One importer of a German refrigerator describes it as 'Britain's Best Value.' Other foreign models carry boldly the nameplate of a well-known British manufacturer, a more detailed inspection inside or at the back being necessary to reveal the country of origin."

Mr Saunders goes on to condemn the misleading use of the term "deep-freeze" used in advertisements in regard to refrigerators which are of conventional construction and performance similar to those of British manufacturers.

"It is quite usual on both British and foreign models to obtain a temporary 'deep-freeze' condition by turning the thermostat knob to a low position. However, the knob must subsequently be put back to the normal position or the temperature in the main compartment will go too low and cause trouble such as, for example, freezing of eggs or liquids. To describe the freezer of such a refrigerator as a 'deep-freeze' is misleading."

The seller of the refrigerator ought not to describe the freezer as a "deep-freeze" compartment unless it can be used for the freezing of fresh food without having to adjust the thermostat, Mr Saunders suggests, adding that very few models available on the British market incorporate this feature. While admitting that British manufacturers are themselves often guilty of failing to make clear to the housewife just what their refrigerator will do in terms of storing frozen food and providing deep-freeze facilities, "at least they refrain from making false claims about its performance."

Mr Saunders told "Electrical Times" that although it was not intended to press for the imposition of unnecessary restrictions on the merchandising of imported refrigerators which might in turn adversely affect the export of British models, the question of seeking official intervention to prevent the more invidious malpractices of the kind referred to was a possibility being considered.

The position is being closely watched by the Domestic Refrigeration Development Committee. Mr Claude Simmonds, secretary of DorDec, told ELECTRICAL TIMES. Where claims for imported refrigerators were thought to be misleading, the Committee took the matter up with the manufacturer or distributor concerned and in two recent cases advertisements had been altered as a result of DorDec representations.

Mr Simmonds described Mr Saunders' letter as "most helpful, and in line with DorDec's own point of view on the matter." He suggested that anyone seeing a claim made for a foreign refrigerator which appeared to be false or misleading should get in touch with DorDec, who would take up the complaint with the advertiser concerned.

British and German 'fridge firms merge

A MERGER is announced between Merseyside Engineering (Refrigeration) Ltd., who market the Everest range of refrigerators, washing machines and heating appliances, and Hans Liebherr, reputed to be the fourth largest manufacturer of refrigerators in Western Germany and the largest crane and building equipment manufacturer in the world.

The merger is being effected through the Leibherr Swiss holding company, Liholding, of Aurich. The Leibherr organisation has eight factories in Germany and others in Ireland and South Africa.

Joint managing directors are C. A. Angelis and T. F. Wissliche, while W. A. F. Walker, director and secretary, also represents the Swiss interests in the UK. The new sales director is A. W. Sinclair.

Refrigerator sales climb in April

THE increasing demand for refrigerators is again reflected in the latest figures issued by DorDec. In April, sales of British-made domestic refrigerators in the home market totalled 119,565, compared with 92,769 in the same month last year—an increase of 29%.

Export sales of refrigerators reached 14,270, showing a 36% increase on April, 1959. DorDec report that about 19% of UK households are now equipped with a refrigerator, compared with 17½% at the end of last year.

Anglo-French link for insulators

AN agreement for full technical collaboration, including exchange of patent rights, has been concluded between Steatite and Porcelain Products Ltd. and the French manufacturer of electrical porcelains, Cie General d'Electro-Ceramique. At the same time both countries will act as selling agents for each other's products in their respective countries.

Steatite add that special ceramics and insulator designs from the French company will be made immediately available to the British market until manufacture is established at their Stourport factory.

COST OF CABLE WAR

THE price war in cables cost the industry probably £5 million revenue, which in normal circumstances should in part have been re-invested in plant modernisation, research, development and the maintenance of a highly competitive position in export markets, Mr W. Glass, chairman of Johnson and Phillips Ltd., reports. In 1959, J. and P. made a trading loss of £91,084, but if prices of cables and transformers (in which there is also keen competition) had been valued at those ruling at the beginning of 1959, additional revenue would have amounted to £465,000, he adds. Since then the position has improved a little.

Modernisation of the Yorkshire Electricity Board's service centre at Market St, Huddersfield, was designed and carried out by the Board's staff. Picture shows the extensive floor space available for the display of a wide range of appliances, and the modern suspended lighting. Facilities include a new demonstration room

Lord Halsbury appointed chairman of L.C.E.

LORD HALSBURY, of Joseph Lucas (Industries) Ltd., has been appointed chairman of a new Anglo-US electronics company, LCE Ltd., which is jointly owned by Lucas (through their subsidiary, G. and E. Bradley Ltd.) and Collins Radio of USA. Nominal capital of the new company is £100,000.

Vice-chairman is Mr J. H. Lasley, of Collins Radio Co. of England. Other directors include Mr C. F. Finch (G. and E. Bradley Ltd.), Mr J. G. Flynn, Jr., Mr F. C. Huston and Mr R. C. Frost (Collins Radio) and Mr C. W. Griffiths (Lucas). In addition, Mr K. Jones has been appointed director and general manager. The chief engineer will be selected from the Collins research and development staff in the USA.

More than 13,000 people are employed by Collins Radio in the USA and over 3,000 are engaged in research and development. Products include equipment for ground and airborne communication, navigation and control; broadcasting; high-speed data transmission and specialised components, much of which will be available for manufacture by LCE Ltd.

A sample range of Collins' designed equipment is to be exhibited for the first time in the UK at the May Fair Hotel, W.1, on 16 and 17 June.

Insulators shot: £5 reward paid

THE £5 reward offered by the South Eastern Electricity Board for information leading to the prosecution of the person responsible for shooting at insulators on overhead power lines (reported in our 26 May issue) has now been claimed and paid. A 16-year-old boy is due to appear at East Grinstead Juvenile Court in connection with the offence.

Eighteen insulators had been damaged beyond repair on one mast, and others damaged elsewhere, resulting in a 5-hour power failure in the East Grinstead area on 17 May.

140 MW TILBURY EXTENSION

THE CEGB has applied to the Minister of Power for consent to the extension of Tilbury generating station by the erection of a new section to be known as Tilbury "B."

This extension is planned to have a total output capacity of 140 MW, with coal-fired boilers. The existing "A" station, with six 60 MW sets, has oil-firing.

Teminal Link-up

AN agreement has been completed between Ross Courtney and Co. Ltd., a subsidiary of Southern Areas Electric Corporation, and Thomas and Betts Co. Inc., of New Jersey, USA, under which the British company is licensed to manufacture and sell in the UK the Thomas and Betts range of loose and strip terminals and associated closing mechanisms. Thomas and Betts is a leading US manufacturer of this equipment.

Shipton Merger Plan

ALL 2s Ordinary shares of E. Shipton and Co. (Holdings) Ltd., signalling and mechanical engineers, are to be bought by Mr Colin Will of English Telephone Co. at 6s 6d per share following agreement with Mr E. Shipton (chairman) together with the trustees of the settlement made by him and one of his co-directors. These holdings are equivalent to about 47% of the issued share capital of Shiptons. Other shareholders will be offered the opportunity to sell at the same price.

Mr Shipton will remain on the board as deputy chairman, other directors being Major-General Sir Leslie Nicholls, Mr Colin Will and Mr Vernon Younger.

It is intended in due course to submit proposals for a merger with English Telephone Co. Ltd. by the acquisition of its shares by Shiptons.

U.K. FAIR O.K.

WITH American show business in the doldrums because of a major dispute between theatre managements and Equity, Britain last week raised the curtain on her own show in New York, and the reception has been enthusiastic. The British Exhibition, opened by Prince Philip last Friday, is staged in the Coliseum building on Broadway and will continue until 26 June. It is the greatest effort of its kind ever made by the British overseas, and the first all-British trade fair in the USA.

In organising the exhibition the Federation of British Industries, the Dollar Exports Council, British Overseas Fairs Ltd., the Central Office of Information and the Board of Trade drew upon all the resources of British industry and inventiveness with two objects in view: to sell British goods to America, and to present a picture of modern industrial Britain which may surprise many Americans who still think of it in terms of thatched cottages and archaic pageantry.

Nearly 400 exhibitors, among whom the electrical industry is well represented, are showing every kind of product, from engineering to food. The exhibition, which cost £3½ million to stage, will need to attract at least half a million visitors in order to pay its way. Last year's Russian exhibition, which was only half the size, drew an attendance of 1·1 million and the British sponsors hope to do better.

Mr W. McFadzean, president of the FBI, told the Press in New York that the exhibition had been put on by private enterprise, without any Government subsidy. Mr Reginald Maudling, president of the Board of Trade, added that it was the biggest exhibition ever staged in New York by a foreign country, and he hoped it would enable the American public to realise that "British science, industry and technology continue to forge ahead."

S. G. Brown purchased

THE Watford firm of gyro-compass makers, electronic and precision engineers, S. G. Brown Ltd., which was taken over by the Admiralty in 1941, is being sold to de Havilland Holdings (part of the Hawker-Siddeley group) and the American Bosch Arma Corporation. The purchase price has not been disclosed.

OFFICIAL PUBLICATIONS

The Demand for Engineering Products in Less Industrialised Countries, and Studies on Latin America and India. Report of Machinery Committee of OEEC. (See page 988.)

BS Glossary of Terms used in Telecommunication (including radio) and Electronics. 35s.

Permanent Supplementary Artificial Lighting of Interiors. Building Research Station Digest No. 135. HMSO. 4d.

Comparative Tests on Heating Office Buildings by Thermal-storage Block heaters and other methods. Utilisation Research Report No. 14. Electricity Council.

New Switchgear Factory opened

A NEW factory—their third in the Boreham Wood area—has been opened by Engel and Gibbs Ltd., switchgear manufacturers. Production in the 30,000 sq ft premises will be concentrated mainly on mercury switch relays and contactors up to 200 A, and the manufacture of complete control panels.

A new development which the firm say they will have in full production in a few months is a combination of sensitive thermometers and mercury relays for railway carriage heating, which is part of British Railways' five-year development plan. Work is also going ahead on applications for de-icing of rail points and signalling control systems.

STEEL MILL ORDER

A 5,000 h.p. d.c. motor and auxiliary drives has been ordered by Samuel Fox and Co. Ltd. from AEI's heavy plant division for a new 40 in. reversing billet mill at the company's Stocksbridge works. The mill motor will be supplied from a mercury arc converter installation comprising 10 grid-controlled pumpless steel tank units connected to give a 12-phase output of 4,000 kW. A closed loop system of speed control will incorporate over-riding limitation of current, voltage and acceleration.

Industrial outlook: Cautious optimism

F.B.I. SURVEY REVEALS RISING COSTS AND LABOUR SHORTAGE

ALTHOUGH manufacturers continue to be optimistic about industrial prospects in the next four months, they anticipate a slowdown in the rate of economic expansion due to rising costs, labour shortages and saturation of plant production capacity. These are the conclusions to be drawn from the latest survey of industrial trends made by the Federation or British Industries.

The survey, the eighth of its kind, is based on information received from 714 FBI member firms representative of British industry generally. The figures show signs of a falling off in business confidence, only just over a quarter of the firms expressing optimism about the general business situation, compared with nearly half in the previous survey last February. Those feeling "less optimistic" rose from 3% to 9%.

The hardening of the labour situation is confirmed by 42% of the firms surveyed, compared with 33% last time. Shortage of skilled labour is quoted as a factor limiting output by more than a quarter of the firms questioned, other restrictive factors being lack of plant capacity (16%), shortage of materials and components (15%), and insufficient orders or sales (15%). Two out of five firms state that they are working below capacity.

An upward trend in selling prices is reported by nearly a quarter of the companies concerned over the past four months, while only 11% report a decrease. Coupled with this is a drop in the average profit margin recorded by nearly two out of five firms, only one in ten noting a gain. This would appear to be due mainly to rising unit costs resulting from pay increases awarded recently in several industries.

The trend in orders and deliveries is still upwards, with the emphasis on the home market. Whereas nearly half the firms reported an increase in total orders since the previous survey, only slightly more than a quarter noted a higher rate of export orders.

The survey would seem to show that further increase in productivity must depend on more investment in labour-saving capital equipment to offset the growing shortage of labour, plus a combined effort by labour and management to increase output per man hour.

NWEB's good year

THE 12 months up to the end of March was a good year, the North Western Electricity Board reported last week. Some 30,000 new consumers were connected and electrical appliances worth £6 million were sold. About £7½ million was spent on reinforcing and developing the supply network. The board now has nearly 1,650,000 consumers, some 400,000 more than in 1948.

Eire Board to pay £3,100

AN action by Mrs Margaret M. Meehan, Tulla, Co. Clare, against Eire Electricity Supply Board for damages for the death of her husband, Denis Patrick Meehan, who had been employed by the board as a linesman, was settled for £3,100 and costs, Mr Justice Murnaghan was told in the High Court last week.

Meehan, who was 48, had been electrocuted while working on a mast near Tulla in August last year. He left £3,700 assets and died intestate.

Six and Seven Stalemate . . .

LITTLE progress was made in establishing a "bridge" between the Common Market "Six" and the EFTA "Seven" at last Thursday's meeting of the 20-nation trade committee in Paris. The Common Market members made it clear that they are not yet prepared for any long-term solution of the Six and Seven trade problem in Europe. Hopes that the UK and the other countries of the Seven might enter into a larger European trading group have been abandoned for the present.

The meeting was mainly concerned with ways of dealing with short-term difficulties. Agreement was reached on the following points once it was realised that the Six were unwilling to negotiate any long-term solution:

A study group should examine the tariff changes contemplated by the Six and Seven with a view to negotiations within the framework of the tariff conference of GATT in September.

The study group should analyse the data collected in the past month by a special committee showing where difficulties might arise for particular industries in individual countries.

The study group should also take into account the views of third party countries outside the Six and Seven and should submit progress reports to the 20-nation trade committee.

In order to achieve further progress the 20-nation trade committee should continue in being to watch the longer term developments so that discussions between the Six and Seven might go on "with due regard to third party countries and in line with members' obligations to GATT."

Meanwhile the attention of the UK will concentrate more on the forthcoming GATT conference which begins at Geneva in September. Quite apart from the Six and Seven skirmishing, important tariff reductions may be negotiated with the USA. In this direction Britain has already indicated willingness to discuss tariff cuts. The Geneva talks are likely to continue into 1961.

. . . but Engineers call for Unity

REPRESENTATIVES of the engineering industries of 12 West European countries, including Britain and France, are to urge their Governments to take all possible steps to break down the present stalemate between the Six and the Seven. This was disclosed by representatives of the UK electrical and mechanical engineering industries on their return to London this week from a conference in Sweden of ORGALIME, the organisation of the engineering trade associations in Western Europe. In a joint statement the UK delegates said:

"There has been a growing feeling throughout the electrical and mechanical engineering industries of Western Europe that it is for industry to make its views known to Governments if we are to avoid a prolonged economic split which could weaken Europe's influence and competitive position.

"The desire for co-operation dominated the discussions in Sweden and for the first time the French engineering industry came down firmly on the side of industrial and economic co-operation between the two trade groups. It is now generally recognised that only a Western Europe which is united economically can meet effectively the growing competition from both East and West."

The British delegates were: Mr W. K. G. Allen (chairman, BEAMA), Mr A. I. Baker (British Engineers' Association), Mr E. N. Griffiths (vice-president, BEA), Mr A. W. Berry (director, BEA) and Mr Stanley F. Steward (director, BEAMA).

Engineering Export Trends

A 128-page report containing statistical studies on engineering exports has been published by the Organisation for European Economic Co-operation. The studies, which deal with the demand for engineering products in less industrialised countries, and analyse the Latin-American and Indian markets, were prepared by the OEEC Machinery Committee which, in November, 1958, decided to turn its attention to the new problems arising for European exporters of engineering products in competition with non-member countries.

The studies are based on freely accessible statistical data, as published by the countries concerned, IMF, UNO Regional Economic Commissions, OEEC, etc. When examining in February, 1960, a summary of findings from these studies, the committee considered that, although based on information already published, they assembled facts likely to be of value to those interested in the development of the engineering industries. The Machinery Committee decided therefore to derestrict the documents and authorise their general distribution in the form of a single booklet.

Careers in Supply

A 40-page illustrated booklet entitled *Careers in Supply — Non-Technical Opportunities* has just been published by the Electricity Council (Education and Training Branch). It presents career opportunities available in the non-technical supply industry and describes some of the many openings available in the administration, accountancy and sales and service.

Copies of the booklet are available on application to the Education and Training Officer, Electricity Council, Winsley St, London, W.1.

500-mile telephone link started

WORK has started on the laying of a 500-mile long telephone cable between Gothenburg, Sweden, and Marske, near Middlesbrough, said to be the longest "two-way" submarine cable in existence.

The cable will have a capacity of 60 simultaneous telephone circuits and will ease the traffic pressure on the Anglo-Dutch cables over which most of the UK-Sweden telephone traffic passes.

Work began last week when HMTS *Monarch*, the world's largest cable ship, sailed from Southampton with polythene dielectric coaxial cable and 28 repeaters supplied by Standard Telephones and Cables Ltd. The associated land cables are being provided by Telegraph Construction and Maintenance Co. Ltd., and power feeding equipment by Westinghouse Brake and Signal Co. Ltd.

Surprise Packet

"OPERATION Surprise Packet," carried out with complete secrecy last week, brought gifts to all employees of Watford Engineering and Manufacturing Co. Ltd. with more than three months' service. The presentations were made by the directors of the company to mark the firm's Diamond Jubilee this year.

Value of each gift matched the length of service of the employee concerned, from fountain pens to clocks and hand-cut glassware.

The gifts came as a complete surprise to the staff, for they had been secretly stored in a disused air-raid shelter and were packed during the night by five senior members of the firm.

Contracts for Supergrid

TWO further contracts for the erection of 275 kV overhead lines have been awarded AEI Construction (Cables and Lines) Division by the South of Scotland Electricity Board.

Totalling over £360,000, the contracts cover two double-circuit steel tower lines with twin 0·4 sq in. SCA conductors per phase. One, from Strathaven to Wishaw, is 7¼ miles long and the other between Strathaven and Neilson, 19¼ miles.

Apprentice burned: Board cleared

TWO summonses against the North Western Electricity Board for allowing unauthorised entry to a substation were dismissed without costs at Wigan Borough Magistrates' Court last week. An apprentice electrician had been extensively burned about the head and arms while attempting to apply a test lamp to exposed 6,600 V busbars in the substation.

The apprentice, 19-year-old Michael McGovern, went to the substation at Victoria Mills cotton works, Wigan, with Thomas Nyland, a NWEB electrician on loan to the firm, to investigate a power failure. Nyland unlocked the substation, removed a switchboard cover and exposed the busbars, then switched on for the purpose of testing. The lights came on and the boiler-house pump started up, indicating that the power was restored.

Nyland told the apprentice to wait while he informed the works engineer. While alone McGovern decided to "test" the busbars with a lamp, thinking they carried 440 V. He was later admitted to hospital in a serious condition.

For the board it was claimed that the switchboard was not properly part of the substation.

Short-circuit death "a mystery"

THE cause of a short-circuit in Valley Road power station, Bradford, which resulted in the death of the shift charge engineer and seriously injured another man, remained a mystery, the Deputy Coroner said at the resumed inquest at Bradford last week on Robert Geoffrey Parr (47), of Shipley, who died following an explosion at the power station on Friday, 13 May.

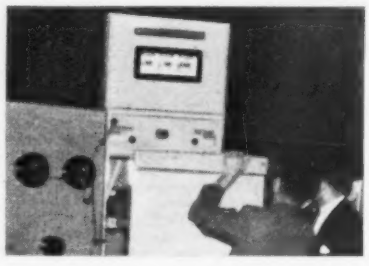
The accident occurred after it was decided to effect a load change-over on a reactor which refused to operate and had to be worked manually, a witness stated. This operation was carried out by Parr and Mr John Kelly, who is still in hospital with serious injuries.

During a subsequent check on indicator lights to show whether the switch-over was complete an explosion occurred. Parr and Kelly were seen to be "coming into the yard blazing furiously—they had little clothes left." The jury returned a verdict of "Death by misadventure."

Another explosion at Valley Road

Another explosion occurred at Valley Road power station, Bradford, last week, resulting in serious injury to the station chemist, Mr Jack Thomas, while he was working in the water-treatment plant. The station was the scene of an earlier explosion in May when a short-circuit blast killed one man and injured another (see inquest report above).

The second explosion was believed to have been caused by gases. Mr G. Varley, station superintendent, stated, but it was not known from what source the gas had come or what kind of gas it was. Mr Thomas was taken to Bradford Royal Infirmary where he was detained with severe burns on face and hands.



Highlight of a private exhibition arranged by Whipp and Bourne Ltd., of Castleton, Rochdale, Lancs, and held in Newcastle upon Tyne recently, was this new h.v. air circuit-breaker, type AH (3·3 kV, 150 MVA, ASTA certified), rated at 1,200 A. Visitors from every kind of industry were able to assess its capabilities and suitability for heavy industrial applications. Also on show were the company's type IF 900 A air circuit-breaker unit and the newer 2,000 A type IFA a.c.b.

Conference on Electronic Telephone Exchanges

SERIOUSLY proposed just after the war, fully electronic telephone exchanges are now becoming a practical prospect. To provide an opportunity for interchange of information and experience on construction and operation of such exchanges, the IEE is planning a conference to be held later this year. Three days are to be allocated to the subject, 22, 23 and 24 Nov., 1960. Authors wishing to have papers considered for presentation to the conference are invited to send their manuscripts to the secretary of the IEE on or before 15 July next. Further details and form of registration, for those wishing to attend the conference, may be obtained on application to the secretary of the IEE.

Electrical House Drying

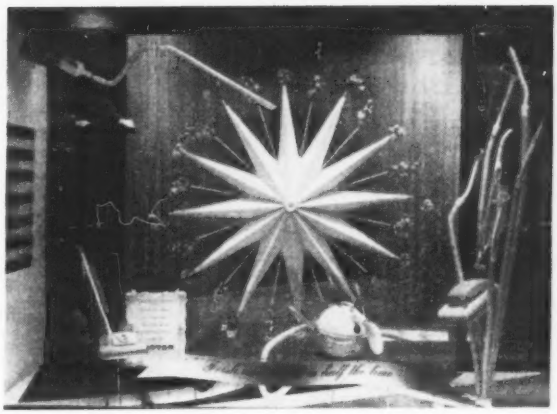
A NEW method of drying out newly plastered houses has been tested on a bungalow at Bishop Auckland, Co. Durham. The builders used eight Westair dehumidifiers, made by Westool, and four fan heaters after the completion of plastering when the walls were dark and saturated with water, although no free moisture was visible on the surface.

More than 62 gallons of water were removed in 12 days, while the average temperature in the bungalow was 35°F and relative humidity 80%. Immediately after the test, the house was ready for complete decoration and occupation.

More Construction in 1960

CONTRACTORS in the UK carried out constructional work to the value of £500 million during the first quarter of 1960, an increase of £36 million more than in the same period last year, according to provisional figures issued by the Ministry of Works. Orders for new work obtained by contractors in the first quarter of 1960 totalled £478 million, compared with £402 million in the same period of 1959.

HOOVER WIN DISPLAY PRIZE



THIS window display at Hoover Hse, Regent St, London, has won the service section first prize in the annual window display contest run by the Regent St Association. The contest challenge trophy was presented to Mr G. D. McKenzie, the company's display and exhibition manager, at the association's annual dinner at the Café Royal. The display features an early summer theme with a "sunburst" motif in paper sculpture and a range of Hoover domestic appliances.

Telephones: More Investment Needed

ALTHOUGH the GPO telephone service finished the year 1958-59 with a surplus of £8·2 million, the percentage increase in the number of telephones in the UK was still the lowest in the world, it is stated in the annual report of the Telecommunication Engineering and Manufacturing Association published last week.

Despite the proposal to separate Post Office finances from the Exchequer, the Post Office would still be subject to an overriding limitation on capital investment by the Treasury in so far as its activities "affect the national economy generally." It was, perhaps, not too much to hope that when this new status was achieved, capital investment limitations would only be set in times of crisis.

Percentage increase in the number of telephones in the UK in 1959 compared with 1958 was 2·3%. Corresponding figures for other countries were: USA, 4·7%; West Germany, 7·6%; USSR, 4%; Italy, 10·8%; Spain, 11·2%; France, 5·8%; and Japan, 11·5%.

There were 560,000 orders for exchange service during the year, including those outstanding at the beginning. Of the 145,000 which remained to be dealt with at the end of the year, 85,000 were under inquiry or being met, leaving 60,000 awaiting plant, compared with 91,000 a year earlier—a "considerable improvement."

Union View

"We cannot be proud of our achievements when we see the progress in other parts of the world and realise that we are falling behind even second-rate countries in telecommunications," Mr S. C. Rosser said in his presidential address to the annual conference of the Post Office Engineering Union at Eastbourne last Monday.

The programme for 70% subscriber trunk dialling by 1966, and a fully automatic system by 1970, was stretching our meagre financial resources to the limit, he pointed out. Both Sweden and Switzerland had more than double the density of telephones in Britain, and their rate of expansion was three times greater than ours. The main reason for this state of affairs was lack of capital investment.

"Proposals will soon be before Parliament to give to the Post Office greater freedom to go about its business of communications," Mr Rosser added. "If we can have the money, ten million telephones in five years would be a realistic target towards a telephone in every home."

Fifth Reactor Course

THE fifth course on the control and instrumentation of reactors, arranged by Harwell Reactor School, will be held at Durley Hall, Bournemouth, Hants, from 12 to 23 Sept., 1960. The course will be open to British and overseas students, primarily those who have a direct interest in the control and instrumentation of nuclear reactors.

Fee for the course is 50 gn, exclusive of accommodation. Application forms, available from the Principal of the school, Atomic Energy Research Establishment, Harwell, Didcot, Berks, must be returned by 25 July next.

Emergency batteries for Hinkley Point

EIGHT large stationary batteries, together with mercury arc and selenium rectifier charging equipment (some of English Electric manufacture) are being supplied by Pritchett and Gold and EPS Co. Ltd., of Dagenham, for the CEGB's 500 MW nuclear power station at Hinkley Point. The order was placed by the consortium comprising English Electric, Babcock and Wilcox, and Taylor Woodrow.

Each of the two reactors will have a standby battery capable of supplying a load of 730 kW at a nominal voltage of 440 V for 15 minutes in the event of an emergency. They will provide power for all reactor essential services and for starting the standby diesel engines.

Emergency lighting will be provided by a 240 V, 2,000 Ah battery capable of supplying an 80 W lighting load for two hours, starting the d.c. motors for the main turbines, and meeting various switch-closing loads.

Two further 110 V batteries will cater for indicating lamp and further switch closing loads, while the telecommunications and alarm system will be powered by three 50 V batteries.

Chairlift for Portsmouth?

AN electrically driven chairlift to link Portsmouth with Hayling Island is to be proposed by British Chair Lifts Ltd., who will put their plan before Portsmouth City Council's Development and Estates Committee tomorrow (17 June). The company envisage an aerial ropeway supported on both sides by 100 ft pylons, capable of carrying some 2,000 passengers an hour together with cycles, prams and motor-cycles.

The plan would have to be approved by the Minister of Transport and the Admiralty as well as the City Council. At present a small private company operates a ferry service of small boats across the 600-yd stretch of water separating the island from Portsmouth.

H.P. Debt nears £1,000 million

TOTAL hire purchase debt at the end of April reached £949 million, of which £341 million was owed to household goods shops and the rest to finance houses, according to the latest Board of Trade figures. This was an overall increase of £29 million over March and a little less than the £31 million increase between February and March. During the 12 months ended last April the total h.p. debt rose by £303 million from £642 million, an increase of nearly 50%.

Although retail sales of durable goods rose slightly during April, there was some falling off in sales of electrical and radio goods by independent traders, the level falling 6% as compared with the same month last year. Sales in this category by department stores rose by 2%, however.

Provisional figures for May show that although retail sales maintained the high level of recent months, there was some falling off of sales by durable goods shops, reflecting the effect of the h.p. curb at the end of April.

Sayings OF THE WEEK

"Though distances are not great, the delivered cost of heat in coal can range from 3d/therm in the Midlands to 5·6d/therm in London." . . . MR D. CLARK and other CEGB planning engineers, in a paper to the Madrid sectional meeting of the WPC.

"Sir Christopher Hinton . . . is the classic example of poacher turned gamekeeper." . . . From *The Economist*.

"In this age of giants, the smaller firms could profitably ally themselves to their larger brothers in the industry and enjoy some of the benefits of their research and development." . . . SIR THOMAS EADES, chairman, Automatic Telephone and Electric Co.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, June 14

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	248	−½
" (3 months)	242½	−1½
LEAD, refined pig, 99·97% purity (cash)	73	−2½
" (3 months)	74	−2½
TIN, refined, min. 99·75% purity (settlement)	789½	+4
(3 months)	787½	+1
ALUMINIUM, ingots 99·99·5% ...	186	—
wire bars (4×4×54")	193½	—
BRASS Strip 63/37	216½	+3½
SILVER (Troy oz)	79¼d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	89½	−1½
" (3 months)	90	−1
RUBBER, per lb.		
No. 1, R.S.S. spot	40½d	+1½d
c.i.f. basis, ports, Aug.	36½d	+½d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	33c	—
Lead (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

£1,000 went to the dogs

A BRANCH manageress of the Midlands Electricity Board who took more than £1,000 in four days from the board and lost it all in betting on the dogs was last week at Oldbury sent for trial at Worcestershire Quarter Sessions, along with a man charged with being an accessory after the fact.

The manageress, Mrs Catherine Ida Livingstone (37), of Stourbridge, was alleged to have taken money initially to lend to a friend who could not repay. She had tried to make good the amount from her salary, but could not, so she took more money and went to Perry Bar in the hope of recouping the sum required on the dogs, but lost the lot. The man, George Henry Biddle, was said to have discussed with her ways of replacing the money.

The alleged offence was discovered when Mr R. Rockliffe, of the board's south west district Birmingham branch, received information that money had not been paid into the bank for four days. When seen, Mrs Livingstone admitted taking the money.

Fact-finding in Russia

A FACT-FINDING mission of the Institute of Directors is to visit Moscow from 20 June to 2 July to study problems of Soviet industrial management.

Headed by Mr H. C. Drayton, the mission will include Sir George Binney (director, United Steel), Mr J. B. Scott (director, Crompton Parkinson), Sir Andrew MacTaggart (chairman, Power Securities), Sir Percy Lister (chairman, R. A. Lister and Co.), and Mr Geoffrey Kitchen (chairman, Pearl Assurance).

Reprinting "Cassier's"

IN August, 1899, *Cassier's Magazine* published a 300-page, profusely illustrated number devoted to the history and development of electric railways and tramways in the UK, Europe and America up to that time. To make this rare "collector's item" more widely available, the Light Railway Transport League propose to reprint it in 8½ by 5½ in. format in hard covers. The price for pre-publication orders will be 2 gn post free (£2 10s after publication). Further details of this venture can be obtained from the secretary of LRTL, 245 Cricklewood Broadway, N.W.2.

A.E.I. Engineering Review

THE first issue of *AEI Engineering Review* was published last week by Associated Electrical Industries Ltd. As an interim measure the journal will replace *BTH Activities, M-V Gazette, Siemens Edison Swan Journal* and *Henley's Distribution of Electricity*. A final format of the *Review* is being designed and will appear in January, 1961, and thereafter monthly; meanwhile the interim publication will be bi-monthly.

News in Brief

Fire which broke out in the Walsall showrooms of the East Midlands Electricity Board caused about £1,000 worth of damage.

The Minister of Housing and Local Government has granted permission for an electricity grid supply point to be erected by the Yorkshire Electricity Board in Warminster Road, Norton Lees, Sheffield, subject to certain conditions.

A public inquiry is to be held at Jarrow on 22 June into proposals by the CEGB to erect a 275 kV line in the area, part of a new line from Blyth to North Yorkshire. Four alternative routes have been suggested, but all are being opposed.

One of London Transport's latest "silver" District line cars is to be shown at the International Exhibition of Aluminium in Railway Rolling Stock in Strasbourg, from 20 to 26 June.

Griffin and George Ltd. have acquired the share capital of R. and J. Beck Ltd.

Company Activities

FURTHER evidence that the current stock market rally is likely to continue came thick and fast last week so that those contemplating any buying programme might now be well advised to climb on the bandwagon. Early in the week we had the opinion of Sir Nutcombe Hume, chairman of Charterhouse Investment Trust, who, in his annual review, stated that "the recent fall in the prices of equities at the same time as industrial prosperity remains high provides better investment opportunities than for quite a long time." This comment was duly followed by a flood of good company news including peak sales and higher profits plus an increased dividend and a 1-for-10 free scrip issue from Metal Box, and the half year results from Steel Company of Wales.

Wall Street lent support by writing up its longest succession of rises this year so that over the week the Dow Jones industrial average rose from 628·98 to 656·42—a rise of 4·4%.

At home we had our own *Financial Times* industrial ordinary index jump from 319·7 to 328·6. And on the reading of the latest questionnaire on industrial trends by the Federation of British Industries it looks as if the firm ground stock markets are now treading is certainly not going to cave in. Industrial confidence, it is clear, continues high and orders continue generally to rise. In fact, one can perceive the seeds of further inflation in the reports of rising costs falling profit margins and the increasing scarcity of labour. And inflation is the most fattening food for the equity.

Leading electrical shares, naturally, were by no means absent in the long list of last week's share gains. AEI were a firmer market at 58s while EMI spurted 2s 3d to 51s. Plessey put on 2s 3d to 49s 3d, Reyrolle, among the "heavies," was marked up 1s 4½d to 42s 3d, while among radios and lighting Thorn Electrical were a bright spot at 51s 9d, up 2s 3d. Morphy-Richards climbed 2s 3d to 23s 9d. Philips Lamps notched up another 3s 9d to 220s but then came back to 116s 3d.

But the electrical market also had its dull spots. Hoover "A" dropped 2s on the week to 46s 9d while Decca dipped 6d to 49s and Vactric 1s 7½d to 30s 3d. English Electric were unchanged at 41s as were Elliott-Automation at 26s on the chairman's statement that "substantial further sums" on plant and buildings in the current year is envisaged.

Despite the net loss of £144,084 against a 1958 profit of £21,397 the £1 Ordinary shares of Johnson and Phillips put on 1s 3d to 20s 3d. No doubt that behind the rise was the statement by chairman Mr William Glass that the most severe part of the storm in the cable industry is over and that the budget for the year forecasts a profit. It is also his opinion that it is possible that further much-needed price increases for cables will materialise. And likewise, British Insulated Callender's Cables obliged with a 1s 1½d lift in the £1 Ordinary shares to 51s 9d.—*From our City Correspondent.*

Aron Electricity Meter

The year ended 31 March last brought a big improvement, with a trading profit of £44,614, against a loss of £14,298 in the previous period. After tax, net profit is £28,726 (*£17,194 loss*), and dividend is again 15%.

Brilliant Signs Ltd.

For 1959 the net profit after tax is £17,843 (*£18,185*), and dividend is maintained at 20% with a final of 15%.

British Thermostat Co.

The order books of all the British subsidiaries stand at a high level and unless there is a major national or international crisis, Mr J. E. Sherlock, the chairman, sees no other reason to forecast a decline in profitability. Efforts to reduce the group's investment in the aircraft industry are being continued. A new factory being built at Sunbury is nearing completion.

Elliott-Automation Ltd.

The net profit for 1959 increased by about 25% to exceed £1 million for the first time, the improvement being attributable in the main to a substantial rise in turnover and to improved efficiency. The policy of installing the latest equipment is continuing and further substantial sums are expected to be spent on plant and buildings in the current year, Mr R. E. F. de Trafford, the chairman, states. Moreover, research and development will continue on a heavy scale. The group now comprises some 50 divisions, each concerned with a particular sector of automation, and subject to unforeseen circumstances, it is expected that 1960 will again be a year of real progress in the affairs of the company.

Engineering and Lighting Equipment Co.

For the year to 31 March last the profit is £136,111 (*£115,850*) before tax, and a final dividend of 15% again makes the total 20%.

Ever Ready Co. (Gt. Britain) Ltd.

The current year's trading to date is encouraging, with sales at home and abroad already ahead of last year, Mr E. N. Rowbotham, the chairman, reports. The company already has an investment in two German companies making dry batteries and it is now acquiring interests in other European countries.

Garrard Engineering and Manfg.

The first few months of this year's home sales have shown a decided improvement over the same months of last year, but recent restrictions on hire purchase facilities may have some effect on the remainder, Mr H. V. Slade, the chairman, reports.

Johnson and Phillips Ltd.

This concern is recovering from the 1959 setback and Mr W. Glass, the chairman, states that the value of the order intake in the second half of 1959 exceeded the first half by 40%, while at the end of April, 1960, the orders in hand were double the level at the beginning of 1959 in spite of the much lower prices now ruling. Since the end of 1959 cable prices have hardened somewhat, but in certain sections, especially in rubber and thermoplastic cables, there is still a long way to go before a reasonable profit will be available. There has also been very keen competition in the transformer business, he adds (and the resulting loss in revenue is referred to on page 985). Overseas the company has substantial interests, with factories in Australia, South Africa, Pakistan and an associated factory in India. Additionally an entirely new investment in India is being negotiated. Concerning future prospects, with the order intake continuing at a high level, he is hopeful, for the board believes that the most severe part of the storm in the cable industry is over. Despite a loss in the first quarter of 1960, a profit is forecast for the year.

Mexican Light and Power Co.

An offer is being made for the Common and Preferred shares, consist- of $20 each for the former and $13 for the latter. Hambros Bank are making the bid on behalf of clients as yet unnamed. Earlier this month Sofina were arranging to dispose of its holding of 40% of the shares of Mexican Light and Power.

E. and H. P. Smith Ltd.

After increased taxation charge, net profit for the year to 31 March last for these wholesale radio and electrical distributors is £14,160 (*£12,174*). Dividend is again 15%.

Walsall Conduits

The group profit for 1960 is £666,047 (*£662,461*), and after smaller taxation charge the net profit is £358,707 (*£340,711*). A final dividend of 10% makes the total 15%—against the equivalent of 12·85% on the smaller capital last time.

Dividends Declared

Harper Engineering and Electronics. Interim 40% (*nil*) on larger capital.

Marco Refrigerators. Interim 2½% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

16 June—Fylde Water Board. Electrical installation in Head Offices, Blackpool.—Advertised 26 May issue.

16 June—Hastings C.B. Electrical installation in College of Further Education, first instalment.—Advertised 9 June issue.

17 June—Cardiff C.C. Electrical installation in Windsor Clive Junior and County Secondary School, Ely.—See 9 June issue.

17 June—Down C.C. (a) Electric lighting and heating installation at new child health clinic, Park Ave, Newcastle.—See 26 May issue.

17 June—Renfrew C.C. Separate trades contract: electrical installation at Bishopton Primary School. Applications to County Clerk, R. Urquhart, County Bldgs, Paisley, by above date.

17 June—Scotland Eastern Hospital Board. (b) Provision of lighting, power and ancillary services; (c) bed and stretcher lifts in new 7,000 sq ft three-storey out-patient and casualty department at Perth Royal Infirmary.—See 9 June issue.

18 June—Mid-Wales Police Authority. (b) Electrical installation in Brynmawr Sub-Divisional H.Q. Applications to County Architect, T. Jestyn Williams, Rhyd Offices, Brecon, by above date.

20 June—Batley B.C. Supply of 140 W and 60 W sodium lanterns and control gear; 140 W and 60 W sodium lamps and jackets; solar dial time switches, wall boxes and back plates.—See 2 June issue.

20 June—Dungannon. (c) Electrical and (d) lift installation in new 200-bed hospital on site of South Tyrone Hospital.—See 9 June issue.

20 June—Herefordshire C.C. Supply and erection of 21 30 ft steel columns and full cut-off lanterns with 200 W linear sodium lamps for A449, Ross By-pass roundabout lighting.—See 9 June issue.

20 June—Newcastle T.C. Supply of sodium and colour corrected mercury vapour lighting lanterns complete with control gear.—Advertised 2 June issue.

20 June—South Liverpool Hospital M.C. Lighting and power installations at Liverpool Chest Hospital, Mount Pleasant.—See 9 June issue.

20 June—Tonbridge R.D.C. Electrical installations by registered contractors in 11 blocks of four flats on three sites on fixed-price basis. Engineer and Surveyor, 48 Pembury Rd.

21 June—Birmingham T.C. Electrical installations, on fixed-price basis, in shops, maisonnettes and flats at Leach Green estate. Contract No. 631.—See 2 June issue.

22 June—Dunbartonshire. Electrical installation in N.A.T.O. Common Infrastructure Slice VII contract: P.O.L. Storage Depot at Rosneath. The work, value £10,000, includes f.l.p. 415 V distribution and control equipment, lighting and heating.—Advertised 2 June issue.

22 June—Durham C.C. (a) Electrical installations in Easington Technical College (stage 2) and Peterlee County Library. Applications to County Architect, South St, Durham, by above date.

22 June—Edinburgh T.C. B: Supply and installation of two high-speed eight-person passenger lifts for each of two 21-storey blocks of flats. Applications to City Architect, City Chmbrs, by above date.

23 June—Belfast C.C. Electrical installation in proposed dining room extension to Maldon St School meals kitchen.—See 2 June issue.

23 June—Rochester C.C. Erection of 187 Class "B" concrete columns together with the supply and fitting of all equipment to columns.—See 9 June issue.

24 June—Ashton-in-Makerfield U.D.C. Supply of concrete columns and equipment for 439 Group "B" m.v. lighting units.—See 9 June issue.

24 June—Dudley C.B. Provision and erection of 705 Group "B" "Stanton" prestressed concrete columns, 90 Group "B" steel columns, and 10 Group "A" lighting points with mercury and some sodium lamps, lanterns and control gear. Applications to Borough Engineer, Council Hse, by above date. Deposit £5 5s.

24 June—Durham C.C. Supply of electric sanitary incinerators for schools. Director of Education, G. H. Metcalfe, Shire Hall, Durham.

24 June—Leatherhead U.D.C. Supply, erection and putting to work of 31 30 ft steel columns with 200 W sodium lanterns on A24 at Ashtead. Engineer and Surveyor, Council Offices.

25 June—Saddleworth U.D.C. Supply and erection of: (contract 1) 121 units and (contract 2) 18 units, comprising concrete columns, brackets, lanterns, auxiliary equipment and wiring. Lighting Superintendent, G. H. Booth, Council Offices, Uppermill, near Oldham.

27 June—Eastleigh B.C. Supply and erection of 182 Group "A" and Group "B" 140 W sodium street lighting units.—See 9 June issue.

27 June—Sunderland C.B. Electrical installations in 14 bungalows, The Oval, Southwick. Borough Architect, Grange Hse, Stockton Rd.

27 June—Manchester C.C. Electrical installation including lighting, underfloor heating and small power to control building, Arnfield Treatment Wks, Tintwistle.—See 2 June issue.

28 June—Manchester C.C. Supply and erection of 415 V cables and auxiliary equipment for secondary sludge treatment plant at Davyhulme Sewage Wks extensions.—Advertised 26 May issue.

29 June—Antrim R.D.C. Supply and erection of fluorescent lamps at Muckamore and Templepatrick. Clerk's Office, The Steeple, Antrim. Deposit £3 3s.

30 June—Belfast C.C. Applications invited for inclusion in select list for the supply and installation of passenger lifts in two 13-storey tower blocks of flats at North Queen St. Applications by 12 noon on above date to Town Clerk, J. Dunlop, City Hall. Further details from consulting engineers, M'Candless and Barton, 6 Murray St, Belfast 1.

30 June—Breconshire C.C. Electrical installation sub-contract (No. 12) in erection of new council chamber. Applications to County Architect, T. Jestyn Williams, Rhyd Offices, Brecon, by above date.

30 June—Cardiff C.C. Contract 5: Erection of 100 Class "A," 600 Class "B" concrete columns and complete installation of fluorescent and sodium lanterns, etc. City Surveyor, City Hall. Deposit £2 2s payable to Corporation.

30 June—Denny and Dunipace T.C. Provision of nine Group "A" points on Glasgow-Stirling Rd scheduled: (a) supply of steel columns; (b) supply of lanterns, lamps and auxiliary equipment; (c) supply of cable and accessories.—See 9 June issue.

30 June—Edinburgh T.C. Supply of three pumps, each of 250 g.p.m. at a 160 ft head capacity along with ancillary electrical equipment, sluice valves, etc., for installation at Fairmilehead. City Water Engineer, 6 Cockburn St, Edinburgh 1.

30 June—Kettering B.C. Provision of 81 400 W and 59 250 W m.v. units on steel columns; contracts as follows: (a) supply of lanterns/auxiliary gear/lamps; (b) supply and erection of columns with wiring/fitting of electrical equipment supplied by another firm; (c) whole work.—See 9 June issue.

30 June—N. Ireland Hsg. Trust. Electrical installations in 46 dwellings in Rathcoole 8c (extension). Trust Offices, 12 Hope St, Belfast.

4 July—Hillsborough R.D.C. (a) Electrical installation in new offices.—See 9 June issue.

4 July—King's Lynn B.C. Dismantling of existing tungsten lighting and erection of tubular steel columns, wall brackets; fixing and wiring of lanterns, lamps and control gear for: (a) Group "A" 25 ft. 400 W mercury colour corrected lighting: (b) Group "B" 15 ft 125 W mercury and 45 W sodium vapour lighting. Borough Engineer, H. G. Ridler, Clifton Hse, 17 Queen St. Deposit £2 2s each group.

5 July—Armagh C.C. Electrical installation in Richmount new three-roomed school. Details from architect, G. D. Taylor, 27a English St, Armagh. Deposit £5.

5 July—Bradford. Electrical work in office

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Dumore" grinders — address for? D.M.—S. R. Golding and Co. Ltd., Power Rd, Chiswick, W.4.

"Lens-Lite" multi-joint desk lamp with magnifier—suppliers of? G.E.—The Electric Depot Ltd., Redbrook La, Brereton, Rugeley, Staffs.

"Madison" hair dryers—makers of? T.E.—Chas. Alexander and Co. Ltd., 74 Portsmouth Rd, Surbiton, Surrey.

"Obo" system for fixing bolts to brickwork—suppliers of? L.E.B.—Douglas Kane Ltd., 5 New Quebec St, W.1.

"Tektor" level indicator switches—makers of? A.C.—Fielden Electronics Ltd., Pasten Rd, Wythenshawe, Manchester.

"Malag" night storage heater—agents for? C.E.—Mantle and Butterworth Ltd., 53 Bury Rd, Rawtenstall, Lancs.

Concordia Electric Safety Lamp Co. Ltd.—address for? R.S.—Melingriffith Wks, Whitchurch, Cardiff.

"Gilbert" photo-electric cells—makers of? T.B.—Gilbert Photo-Electronics Ltd., 180 Twickenham Rd, Isleworth, Middx.

"Armourlight" glass insulators—makers of? E.E.—Pilkington Brothers Ltd., St. Helens, Lancs.

block, warehouse and glass dept. for Rycroft and Co. Ltd.—See 9 June issue.

8 July—Co. Derry. Electrical installation in new voluntary secondary intermediate school for Rev. P. Dillon. Details from consulting engineers, Varming and Mulcahy, 37 Malone Rd, Belfast. Deposit £5 5s.

8 July—Darlington R.D.C. Supply and erection complete of three recirculation pump sets with electric motors automatically controlled, two of 1,200 g.p.m. each at a 28 ft head and one of 100 g.p.m. against a 20 ft head. Details from consulting engineers, A. Brooksbank and Son, 48 Sunbridge Rd, Bradford 1. Deposit £5, payable to R.D.C.

9 July—Bridgwater B.C. Supply and erection of 200 sodium and mercury fluorescent lamps on 15 ft prestressed concrete columns plus the conversion of 50 tungsten units to mercury/fluorescent; contract includes the supply and jointing of underground cables. —See 2 June issue.

12 July—Queensbury and Shelf U.D.C. Separate trade tender electrical work in erection of a pavilion, Shelf Hall Pk. Engineer and Surveyor, Council Offices, Queensbury. Deposit £2 2s.

12 July—Southport C.B. (1) Electrical installation sub-contract in proposed Occupation and Industrial Centre, Sandbrook Rd, Ainsdale.—See 9 June issue.

18 July—Irwell Valley Water Board. Supply and erection of automatic electric pumping plant, Whitfield, to deal with constant 2 m.g.d. flow.—See 2 June issue.

22 July—Reading C.B. Supply and installation of cables, switchgear, fittings and accessories for distribution, control and site lighting for new Manor Farm Sewage Disposal Works, which is under construction. —See 9 June issue.

29 July—Brighton C.B. Supply, erection and maintenance of three electrically driven submersible well pumps and four booster pumps with control gear, etc. Waterworks Engineer, 12 Bond St, Brighton 1. Deposit £5 5s.

13 Sept.—Cardiff C.C. Supply and erection of pumps, motors, switchgear, screens and other electrical and mechanical plant for complete pumping stations at Usk and Pontypool contract B.2 of Llandegfedd scheme. Engineer, Sluvad, Panteg, near Pontypool. Deposit £3 3s, payable to Corpn.

No date stated—Ayr C.C. (1) Supply of concrete columns; (2) supply of electrical equipment; (3) erection; (4) supply of lanterns for 140 W SO/H lamps for Ballantrae A77 street lighting. Water and Drainage Engineer, County Bldgs, Ayr.

No date stated—Scotland. Supply of 1-200 kW 440 volt motor-driven induction heating generator, complete with condenser cubicle and all associated switchgear.—See 2 June issue.

No date stated—Taf Fechan Water Supply Board. Conversion to a.c. of treatment works at Pontsticill, near Merthyr Tydfil, including: (1) goods lift; (2) supply of pumps; (3) supply of air compressors; (4) supply of 415 V switchboard including 150 A c.b.; (5) supply of 250 yd cable; (6) supply of small geared motor units; (7) supply and installation of one 50 kW water turbine alternator set complete with switchboard; (8) supply and installation of cables, etc., for rewiring and wiring of new equipment by contractors on N.I.C.E.I.C. Roll. Applications to consulting engineers, Binnie, Deacon and Gourley, Artillery Hse, Artillery Row, S.W.1.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

21 June—Colombia. Diesel generating plant 25, 30 and 50 kW, 127/220 V, 60 c/s for three aqueduct schemes. Instituto Nacional de Fomento Municipal, Departamento Comercial, Carrera 13, No. 18/51, Oficino, Bogota. B.o.T. (ESB/15160/1/2/60).*

23 June—Costa Rica. 6,000 metres 4/0 A.W.G. a.c.s.r. conductor. La Proveedurca, Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/15149/60).*

28 June—America. One 3 ph 60 c/s outdoor autotransformer with tank-mounted lightning arresters. Dept. of Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/14693/60).*

30 June—America. One 13,800/240 V 500 kVA outdoor unit substation. Dept. of Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/14692/60).*

2 July—Jordan. Two 5,000 kVa 33/6·6 kV transformers and two 250 kVA 6·6 kV 400/230 V transformers for use at Marqu Power Station. General Manager, Transjordan Electric Power Co., P.O. Box 618, Amman. B.o.T. (ESB/14570/60).*

2 July—Nigeria. One eight-panel 11 kV 250 MVA switchboard. Resident Engineer, Electricity Corpn. of Nigeria, Adelphi, John Adam St, W.C.2.

5 July—Sudan. Eight items of lamps from 15 W, 24 V to 150 W, 240 W in quantities of between 1,000 and 6,000. Sudan Government Purchasing Agent, 3-5 Cleveland Row, S.W.1. B.o.T. (ESB/14642/60).*

7 July—Australia. Two 66/22 kV, 5,000 kVA tap changing transformers for State Electricity Commission. Western Australian Government Tender Board, 74 Murray St, Perth. B.o.T. (ESB/15138/60).*

8 July—New Zealand. 21 items of potentiometers and resistors. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/13952/60).*

11 July—India. 11 kV 250 MVA switchgear. General Manager, Delhi Electric Supply Undertaking. Rajghat, P.O. Box 589, New Delhi. B.o.T. (ESB/14544/60).*

13 July—New Zealand. Six miles of p.v.c. insulated lead alloy sheathed telephone cable of 202 and 252 pairs. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/14663/60).*

14 July—S. Africa. 11·5 kV, 250 MVA switchboards including 49 o.c.b. panels. Town Clerk, City Hall, Pretoria. B.o.T. (ESB/14210/60).*

20 July—New Zealand. Capacitors—nine items. Director-General (Stores Division), G.P.O. Wellington. B.o.T. (ESB/14664/60).*

25 July—Sudan. 47,094 metres 7 quad and 26,052 metres 4 quad polythene trunk cable. Controller, Stores and Workshops, Dept. of Posts and Telegraphs, Light Industrial Area, Khartoum South. B.o.T. (ESB/14666/60).*

29 July—Australia. 33 kV metalclad switchgear. Town Clerk, Brisbane C.C., City Hall, Brisbane. B.o.T. (ESB/13915/60).*

1 Aug.—India. Three 12/4/8 MVA 66/33/11 kV transformers for Gurgagon and Faribad substations. Details from Chief Engr. (Nth), Projects Section, Punjab State Electricity Board, 9 Ram Bagh Bldg, Patiala, on payment of Rs. 20 by Indian P.O. only, payable to Executive Eng., Punjab S.E.B., Gurgagon Division.

8 Aug.—India. 11, 33 and 132 kV transformers, switchgear, etc., for substations at Mau, Gorakhpur and Varanasi for Rihand interconnection scheme. Specification R-50 available, on payment of Rs. 100 by money order only, from S. N. Singh, Superintending Engr., Director Designs, Rihand Project, H.-E. Design Directorate, 10/489 Allengarij, Kanpur.

17 Aug.—India. Power line carrier current communication equipment. Chief Engineer, Kerala State Electricity Board, P.B.65, Truvandrum 1. B.o.T. (ESB/14550/60).*

30 Aug—New Zealand. 272 single circuit 220 kV galvanised steel transmission towers. Secretary, Tenders Committee, N.Z. Electricity Dept., Wellington. B.o.T. (ESB/15170/60).*

31 Aug.—Portuguese East Africa. Seven motor generator sets. Ports, Railways and Transport Dept., Lorenço Marques. B.o.T. (ESB/14250/60).*

1 Nov.—Canada. Three 150,000 h.p. Kaplan turbines for Grand Rapids. J. D. Walker, Supply Director, Manitoba H.E.B. B.o.T. (ESB/13924/60).*

TRADE NOTES

Change of Address. The head offices of Rhodes, Brydon and Youatt Ltd., have moved to the new Reddish Engineering Works, Stockport, Cheshire. Telephone: Heaton Moor 6211.

Pending the completion of new offices at Cromwell Rd, Kensington, in 1961, the British Ferrograph Recorder Co. Ltd., are moving on 24 June to temporary offices at 88 Horseferry Rd, Victoria, S.W.1. Telephone No. SULlivan 5426.

Expansion. As part of an expansion scheme, Solartron Laboratory Instruments are planning to move to a new factory at Cox La, Chessington, probably early next year.

Burmese Imports. The Government of Burma have announced that certain specified goods may in future be only imported through Burmese commission agents. Among the items listed are electrical goods, household goods, radios and domestic refrigerators. The restriction applies this month but does not affect goods imported on existing licences (most of which are valid for shipment up to 30 Sept.).

A.E.I. Purchasing. From this week the purchasing departments of the Woolwich group of Associated Electrical Industries Ltd., at Milton Court, Dorking and South Woolwich, are being centralised at the latter address, and will be responsible for the buying for factories at Birtley, Gravesend and S. Woolwich. Mr Rivett, who was previously the buyer for W. T. Henley's, is purchasing officer for the Cable Division.

CONTRACTS PLACED

Durham C.C. Electrical work in: Durham Girls' Grammar School, Tanjon (Newcastle) Ltd., £7,842; Hebburn Colliery County School and Ryhope Modern School, North of England Engineering and Electrical Co. Ltd., £200 16s and £945 respectively; Newton Aycliffe Campus School, Williams Bros. Ltd., £7,211; Peterlee Acre Rigg School and Seaham branch library, Edgar Phillips Ltd., £215 12s and £860 5s, respectively. Recommended.

Lowestoft B.C. Electrical installations in 66 dwellings. Mariners St and Park Rd, Lowestoft Electrical Co. Ltd., £3,403. Recommended.

Sheffield C.C. Electrical installations in 208 flats in Brookhill area, Holiday, Hall and Stinson Ltd., £20,513.

Wessex Hospital Board. Electrical work in: staff cottages at Park Prewett Hospital, Homer-Gray, £1,554; Port Bredy Hospital, H. W. Smith, £4,180; new ward block and nurses' home extension at Poole General Hospital, Poole Electrics Ltd., £34,996; Ward F1 at St. James's Hospital, Bowerman Bros., £1,280; bed passenger lift at St. James's Hospital, Portsmouth, Evans Lifts, £4,290; new maternity unit at Southampton General Hospital, Groves and Co., £2,250. Recommended.

BUSINESS PROSPECTS

Alfreton R.C. Authorities plan Firs Estate Primary School.

Basildon. Sir John Burnet, Tait and Partners, 10 Bedford Sq, W.C.1, architects for £100,000 East Walk shopping centre. Chesterfield Properties Ltd.

Bath T.C. Tender: four-storey shop/flat block. Planning Officer, 7 N. Parade Bldgs.

Bathgate. H. W. Weedon and Partners, Calthorpe Rd, Edgbaston, Birmingham, architects for £5¼ million British Motor Corporation factories.

Belfast. Robert McKinstry, 58 Rugby Rd, architect for College Pk student centre.

Birkenhead B.C. Tender: 110 Prenton Dell Estate dwellings. Architect.

Birmingham T.C. Tender: 24 one- and two-storey Rubery buildings. Architect.

Blackpool. Sunnytoys, Cowley Rd, plan Back Collings Ave factory.

Bootle B.C. Tender: St. Oswald's Infants' School, Netherton. Surveyor.

Bradford. Tender: Edmund Campion Six for secondary school, Rhodesway. Architect, J. H. Langtry-Langton, 8 Oak Mt, Manningham.

Bromley. Rice and Son, 15 Stockwell Rd, S.W., contractors for £83,000 Nursing Institute.

Bucks C.C. Aylesbury College students hostel planned. An R.C. primary school and special school, Aylesbury, Bedgrove Primary School, replacement of buildings at County Farm, extensions to Aylesbury Grammar School and Princes Risborough School.

Cheltenham. Gloucestershire Education Committee approves £371,939 Training College of Domestic Science expansion scheme.

Chessington. Donaldson and Co., 75 London Rd, Kingston upon Thames, architects for Marsden and Shiers extensions.

Coleraine, Co. Londonderry. Harbour Board plan £29,000 reconstruction of wharf.

Corstorphine. Tender: Public Library. City Architect, Edinburgh.

Coventry. Alfred Herbert Ltd. plan land development Cross Rd.—J. A. McLean and Sons, 33 Queen St, plan Torrington Estate site development.

Crook. West Hunwick Selicar and Firebrick Co. plan £250,000 development.

Croydon. Robert Matthew and Johnson-Marshall, 24 Park Sq East, N.W.1, architects for Royal Warehousemen Clerks' and Drapers' School.

Cumbernauld Development Corporation. Tender: 147 two-storey houses and garages, Seafar Housing Dev. Chief Architect.

Darwen. I.C.I. plan £500,000 modernisation scheme.

Dewsbury B.C. Firth, Son and Blackburn, Broadway Hse, Crackenedge La, architects for Thornhill Secondary School.—Architect to plan Wheelwright Grammar School for Boys £20,000 improvements.

Doncaster. £3 million extensions scheme for Doncaster Royal Infirmary planned by Regional Hospital Board, Old Fulwood Rd. —£2 million extension programme proposed by British Ropes, Carhill, Balby.—£500,000 extensions planned by Ford Motor Co., Dagenham, Essex.

Dungannon R.D.C. F. M. W. Schofield, 120 Marchmont Rd, Edinburgh 9, architect for re-development of Caledon.

Durham. T. Worthington and Sons, 178 Oxford Rd, Manchester, architects for Hatfield College students' accommodation. **C.C.** Electric rewiring scheme for West Stanley Shield Row Mixed School. Architect.

Eastbourne. New Era Laboratories, Wells Hse, Britton St, E.C.1, plan 10,000 sq ft Brampton Rd Trading Estate factory.—Hill and Co. (Tools), Eastbourne Rd, Polegate, Sussex, also plan Brampton factory.

Eccles. Scottish Brewers, Abbey Brewery, Holyrood Rd, Edinburgh 8, plan bottling halls, etc., Victoria Mills.—Regent Tyre and Rubber Co., 207 Oxford St, W.1, plan store and offices. Enterprise Wks, Clifford St.—Francis Jones and Son, 178 Oxford Rd, Manchester 13, architects for Joseph Toft warehouse and showrooms.—Joseph Chapman and Son, 178 Oxford Rd, Manchester 13, plan Green La vehicle repair shop.—A. N. Butland, L.M. Region, B.R., 5a Euston Gr, N.W.1, architects for B.R. Commission Wellington Rd Social Club.

Edinburgh T.C. £1 million Colinton Rd Napier Technical College planned.

Gateshead. Arthur and Kirkup, 13 Swinburne St, architects for Hay and Hindmarsh meat processing factory, Saltmeadows Rd.—Alnwick Construction Co., Alnwick, Northumberland, contractors for Dixon Corbitt Ltd. works extensions.—**C.C.** £362,000 school building programme.

Glasgow. W. H. Dinsmore and Sons, 102 Bath St, quantity surveyors for Larkfield bus works development. Transport Commission. —J. S. Burns and Sons, 195 Buccleuch St, plan Torr St works and offices.—British Oxygen Gases plan three Polmadie Rd buildings.—Scottish Farmers' Dairy Co., 110 Millroad St, plan Castlemilk Industrial Area creamery and transport depot.—Commercial Holdings, 36 Wigmore St, W.1, plan six-storey offices/showrooms, Cadogan St, C.2.

Halifax. John Mackintosh and Sons, Albion Mills, plan £1 million premises.

Hamilton T.C. Tender: 122 Udston-Hill-house houses and garages. Burgh Architect.

Harrogate. I.C.I. Fibres Division, Hookstone Rd, plan £1 million development.

Hebburn. J. M. Angus, 3 Gallowgate, Newcastle, architect for Toner Ave British Legion club.

Heckmondwike. Samuel Jackson and Son, Ocean Chambers, Piccadilly, Bradford 1, architects for £110,000 grammar school extension scheme for West Riding E.C.

Holmfirth U.D.C. Tender: 10 Netherfield Estate bungalows. P. N. Brown and Son, Market Pl.

Hornchurch. F. G. Broadbent and Partners, Kirkland Hse, Whitehall, S.W.1, architects for £260,000 St. Ignatius Roman Catholic School, Wingletye La.

Inverness C.C. Tender: 36 Caol houses, near Fort William. Architect.

Kendal. Manchester Hospital Board, Cheetwood Rd, plan new theatre and boiler-house, Westmoreland County Hospital.—£30,000 Rodgett Infirmary, Lancaster, kitchen, etc.

Kingswood U.D.C. Tender: 42 houses and flats, Pound Rd. Clerk.

Larne B.C. Mill St re-development planned including 46 dwellings.

Limavady R.D.C. 52 houses and garages planned, £86,000.

London. Tunnel Glucose Refineries, Tunnel Ave, Greenwich, S.E.10, plan 800-ton maize silo.—Tooley and Foster, Midland Bank Chambers, Queen's Rd, Buckhurst Hill, architects for £425,000 five-storey building for Royal Northern Hospital, Holloway.—Cecil F. Baker and Partners, 20 Lowndes St, S.W.1, quantity surveyors for re-development of St. Giles Hospital, Camberwell.—E. W. Palmer and Partners, 8 The Town, Enfield, architects for Manor Hse Hospital extensions, North End Rd, N.W.11.—Geo. Davies and Webby, 112 Jermyn St, S.W.1, architects for 13-storey hotel planned for South Bank. Cost £3 million.—T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1, architects for 22-storey Bayswater Rd hotel.—Lamb, Biel and Partners, 16 Bryanston St, W.1, architects for 12-storey Bayswater Rd hotel.—S. Gordon Jeeves, 61 Catherine Pl, S.W.1, architects for 12-storey Bayswater Rd flats. —L. G. Dight, 35 Portland Pl, architects for £100,000 Atlas Securities, Lower Sloane St flats and shops.—Joseph, 10 Lowndes Sq, S.W.1, architects for £200,000 luxury flats, 1-5 Lowndes Sq.—Tender: Cromwell Curve air terminal. Sir John Burnet, Tait and Partners, architects.—Holland and Hannen and Cubitts, 1 Queen Anne's Gate, contractors for £500,000 offices on site of London Transport High St. Putney depot.

Maidstone. Frank Batty and Smith, 18 Spring St, W.2, contractors for 4,920 sq ft Factory Holdings Group factory, Park Wood Trading Estate.—Ian Fraser and Associates, 15 Bedford St, W.C.2, architects for further Factory Holdings' Park Wood buildings.

Manchester. Hanover Mills Co., Buxton St, plan two-storey River St workshops/offices.

Middlesbrough T.C. Tender: 20 Pallister Pk and 39 Easterside houses. Engineer.

Middlesex. Anglo-Swiss (Colnbrook), West Drayton, plan Pyle Industrial Estate factory.

Newburn. Taylor Woodrow Construction, Southall, Middx, contractors for £200,000 plant manufacturing works, Newburn, for Aveling-Barford.

Newcastle. L. G. Mouchell and Partners, 24 Claremont Pl, consulting engineers for British Paints old factory/warehouse.—L. J. Couves and Partners, Grainger Chambers, Hood St, architects for Bonded Warehousing Co. Hanover St warehouse.—**T.C.** 15-storey block 90 flats and seven houses, St. Cuthbert's Rd. Fenham. Architect.

N. Riding C.C. Whitby Fire Station additions planned, Architect. — Tenders shortly for George Pindar Modern School, architects: Collins, Melvin, Ward and Ptnrs, 15 Manchester Sq, W.1.

Peterlee. Tender: Junior R.C. school, Westway. Architect: D. Brown, 10 Lambton Rd, Jesmond, Newcastle.

Plymouth. Associated Portland Cement Manufacturers Ltd., Portland Hse, Tothill St, S.W.1, plan £2 million rebuilding and extension of Plymstock Wks.

Pontardawe R.D.C. Tender: 26 Rhos dwellings. Engineer and Surveyor.

Ponteland. Lillie and Co., Armstrong St, Gosforth 3, contractors for Cordar Roof Lights new factory.

Preston. U.K. Atomic Energy Authority, 11 Charles II St, S.W.1, plan £500,000 Springfield uranium recovery plant.

St. Helens. Triplex Safety Glass Co. plan £1 million expansion plan affecting mostly the Eccleston and King's Norton factories. London office, 1 Albemarle St, W.1.

Scarborough. Additions to Convent of the Ladies of St. Mary, St. Thomas St, planned by Mother Superior.

Seaham U.D.C. Tender: 64 two-storey flats, Station Rd. Engineer and Surveyor.

Shrewsbury. Birmingham Hospital Board plan £27,925 Copthorne Hospital temporary out-patients' department.

S. Shields. Page, Son and Hill, 67 King St, architects for £120,000 Dyeworks Ltd. extensions.

Stockton-on-Tees. Fox and Co., High Barnes Wks, Sunderland, plan 62 Norton Hill houses.

Sunderland. L. J. Couves and Ptnrs., Grainger Chmbrs, Hood St, Newcastle, architects for J. A. Jobling and Co. factory extensions.—**T.C.** Humbledon training centre planned. Architect: H. C. Bishop, Grange Hse, Stockton Rd.

Wakefield T.C. Tender: 12 Ivy Hse Estate bungalows. Engineer.

Wandsworth B.C. Installation of 14,000 socket outlets in 2,862 dwellings proposed.

Wantage U.D.C. Tender: 20 bungalows. Architect.

Wigan. Blue Printers plan Leyland Mill, Haigh, factory extensions.

Wigton. ITA plan Brocklebank TV stn.

Woebley R.D.C. Tender: 32 housing units, Burton Wood. Clerk.

Woking U.D.C. Tender: 52 maisonnettes in four storeys. Engineer and Surveyor.

Wrexham. Air Products (Gt. Britain), St. Giles Hse, Poland St, W.1, plan £100,000 Acrefair extensions scheme.

Overseas

Pakistan. Union Electric Co., 1 Bull Rd, Lahore, require ½ to 100 h.p. a.c. motors, switches, starters, etc., on a sole agency basis.

Company Meeting

Telephone Rentals LIMITED
OPERATING TR SERVICES

ANOTHER SUCCESSFUL YEAR

Volume of New Business Again a Record

MR. W. STUART PHILCOX'S STATEMENT

THE thirty-first annual general meeting of Telephone Rentals Ltd. was held on 8 June at the Registered Office, 197 Knightsbridge, London S.W.7, Mr W. Stuart Philcox, D.F.C., M.A. (chairman and managing director), presiding.

The following is an extract from the statement by the chairman which had been circulated with the report and accounts for the year ended 31 December, 1959:

Before commenting on the results of the year under review, I must refer to the loss we have suffered through the death, on 14 August, 1959, of the founder of our business, Mr Fred T. Jackson.

It would be almost impossible in a few sentences to pay adequate tribute to the qualities of this man. We have therefore sent to each shareholder a copy of the memorial issue of our T.R. Journal which demonstrates as no words of mine could do the remarkable esteem and high regard in which he was held by so many both inside and outside your company.

Telephone Rentals has a very strongly developed family spirit and it as the head of a family that we shall miss him most.

The Year's Trading

I am very glad to be able to report that once again your company has had a very successful year. In this country, in spite of increased competition, the amount of new business we did was again a record. Not only was there an increase in the total number of contracts both with new and existing subscribers, but the number of contracts for large installations included in the total was considerably greater, whilst the business was widely spread over the full range of T.R. Services.

This success was, of course, largely due to the upsurge in industrial production which developed throughout the country during the course of the year, but it also reflected the concentrated attention paid to training and instruction on the sales side in recent years.

Our subsidiary company, Electro Rentals Ltd., which deals solely with refrigeration on rental, has continued to make steady progress. Certain changes in its sales policy may well lead to an accelerated rate of growth in the future.

Overseas

I can also report that our overseas companies have continued to make satisfactory progress. Although these companies still form a relatively small part of our total enterprise, they are growing rapidly and will undoubtedly make a valuable contribution to the strength of the organisation. Trading conditions obviously fluctuate from time to time in any one country, including Great Britain, and these overseas operations will add to the stability of your company.

All the overseas companies, with the exception of Canada, traded at a profit during the year and all, except Canada and Paris, paid a dividend either direct or, in the case of South Africa, to our holding company there, Telephone Rentals (South Africa) (Pty.) Ltd.

We anticipate that Paris will be in a position to pay a dividend at the end of the current year, but it will still be some years before Canada will be similarly situated. We tend to forget how long it took to establish a profitable rental business in Great Britain during the first quarter of the present century and we shall be wise to reconcile ourselves to a long period of relatively slow progress in Canada.

Dividend

As the result of all these activities, the Consolidated Profit before Tax amounted to £1,294,581, which represents an increase of £170,521 on the previous year and is the highest we have so far achieved.

Taking all factors into consideration, your directors feel justified in recommending a final dividend of 10% making, with the interim dividend paid in Jan., 1960, a total for the year of 15%.

As we have found from hard experience, it is most desirable that a company of this nature should as far as possible be able to finance its operations from its own resources. As has been repeatedly stated in the past, the board would not be prepared to recommend an increased dividend if there was a risk of the liquid resources of the company being seriously weakened or if the future prospects seemed to make it unlikely that the increased rate could be maintained.

At the present time our liquid resources are satisfactory and I am glad to say that during the first four months of the current year there has been no falling off in the level of business. Unless some completely unforeseen circumstances should arise, we therefore feel we may reasonably anticipate maintaining the payment of the dividend at 15%.

Profit and Loss Account

Trading income is up by £204,691, Dividends and Interest receivable by £30,656, whilst on the other side Operating Expenses are up by the moderate sum of £16,688, Directors' Emoluments by £21,925 and Depreciation by £30,524.

The Net Profit after Tax, but before transfers to Reserves and provisions for Dividends, is £785,853. We have transferred to the Tax Equalisation Reserve £76,000, which is £91,000 less than was required in 1958, mainly due to the special adjustment made last year to cover the difference in basis of the Profits Tax Levy. The sum of £430,420 has been transferred to the General Reserve.

After providing for the transfers to Reserves, and the Dividends on both the Preference and Ordinary Shares amounting to £243,873, as compared with £187,494 in 1958, we are left with an unappropriated Profit balance of £232,255 to be carried forward to 1960.

Consolidated Balance Sheet and Profit and Loss Account

As previously stated, the Net Profit before Tax is £1,294,581, and after providing for Taxation, transfers to Reserves and Dividends, the balance of unappropriated Profits carried forward and attributable to the Holding Company's Shareholders amounts to £420,486.

The report and accounts were adopted.

BUSINESS PROSPECTS

Alfreton R.C. Authorities plan Firs Estate Primary School.

Basildon. Sir John Burnet, Tait and Partners, 10 Bedford Sq, W.C.1, architects for £100,000 East Walk shopping centre. Chesterfield Properties Ltd.

Bath T.C. Tender: four-storey shop/flat block. Planning Officer, 7 N. Parade Bldgs.

Bathgate. H. W. Weedon and Partners, Calthorpe Rd, Edgbaston, Birmingham, architects for £5½ million British Motor Corporation factories.

Belfast. Robert McKinstry, 58 Rugby Rd, architect for College Pk student centre.

Birkenhead B.C. Tender: 110 Prenton Dell Estate dwellings. Architect.

Birmingham T.C. Tender: 24 one- and two-storey Rubery buildings. Architect.

Blackpool. Sunnytoys, Cowley Rd, plan Back Collings Ave factory.

Bootle B.C. Tender: St. Oswald's Infants' School, Netherton. Surveyor.

Bradford. Tender: Edmund Campion Six for secondary school, Rhodesway. Architect, J. H. Langtry-Langton, 8 Oak Mt, Manningham.

Bromley. Rice and Son, 15 Stockwell Rd, S.W., contractors for £83,000 Nursing Institute.

Bucks C.C. Aylesbury College students hostel planned. An R.C. primary school and special school, Aylesbury, Bedgrove Primary School, replacement of buildings at County Farm, extensions to Aylesbury Grammar School and Princes Risborough School.

Cheltenham. Gloucestershire Education Committee approves £371,939 Training College of Domestic Science expansion scheme.

Chessington. Donaldson and Co., 75 London Rd, Kingston upon Thames, architects for Marsden and Shiers extensions.

Coleraine, Co. Londonderry. Harbour Board plan £29,000 reconstruction of wharf.

Corstorphine. Tender: Public Library. City Architect, Edinburgh.

Coventry. Alfred Herbert Ltd. plan land development Cross Rd.—J. A. McLean and Sons, 33 Queen St, plan Torrington Estate site development.

Crook. West Hunwick Selicar and Firebrick Co. plan £250,000 development.

Croydon. Robert Matthew and Johnson-Marshall, 24 Park Sq East, N.W.1, architects for Royal Warehousemen Clerks' and Drapers' School.

Cumbernauld Development Corporation. Tender: 147 two-storey houses and garages, Seafar Housing Dev. Chief Architect.

Darwen. I.C.I. plan £500,000 modernisation scheme.

Dewsbury B.C. Firth, Son and Blackburn, Broadway Hse, Crackenedge La, architects for Thornhill Secondary School.—Architect to plan Wheelwright Grammar School for Boys £20,000 improvements.

Doncaster. £3 million extensions scheme for Doncaster Royal Infirmary planned by Regional Hospital Board, Old Fulwood Rd. —£2 million extension programme proposed by British Ropes, Carhill, Balby.—£500,000 extensions planned by Ford Motor Co., Dagenham, Essex.

Dungannon R.D.C. F. M. W. Schofield, 120 Marchmont Rd, Edinburgh 9, architect for re-development of Caledon.

Durham. T. Worthington and Sons, 178 Oxford Rd, Manchester, architects for Hatfield College students' accommodation. **C.C.** Electric rewiring scheme for West Stanley Shield Row Mixed School. Architect.

Eastbourne. New Era Laboratories, Wells Hse, Britton St, E.C.1, plan 10,000 sq ft Brampton Rd Trading Estate factory.—Hill and Co. (Tools), Eastbourne Rd, Polegate, Sussex, also plan Brampton factory.

Eccles. Scottish Brewers, Abbey Brewery, Holyrood Rd, Edinburgh 8, plan bottling halls, etc., Victoria Mills.—Regent Tyre and Rubber Co., 207 Oxford St, W.1, plan store and offices, Enterprise Wks, Clifford St.—Francis Jones and Son, 178 Oxford Rd, Manchester 13, architects for Joseph Toft warehouse and showrooms.—Joseph Chapman and Son, 178 Oxford Rd, Manchester 13, plan Green La vehicle repair shop.—A. N. Butland, L.M. Region, B.R., 5a Euston Gr, N.W.1, architects for B.R. Commission Wellington Rd Social Club.

Edinburgh T.C. £1 million Colinton Rd Napier Technical College planned.

Gateshead. Arthur and Kirkup, 13 Swinburne St, architects for Hay and Hindmarsh meat processing factory, Saltmeadows Rd.—Alnwick Construction Co., Alnwick, Northumberland, contractors for Dixon Corbitt Ltd. works extensions.—**C.C.** £362,000 school building programme.

Glasgow. W. H. Dinsmore and Sons, 102 Bath St, quantity surveyors for Larkfield bus works development. Transport Commission. —J. S. Burns and Sons, 195 Buccleuch St, plan Torr St works and offices.—British Oxygen Gases plan three Polmadie Rd buildings.—Scottish Farmers' Dairy Co., 110 Millroad St, plan Castlemilk Industrial Area creamery and transport depot.—Commercial Holdings, 36 Wigmore St, W.1, plan six-storey offices/showrooms, Cadogan St, C.2.

Halifax. John Mackintosh and Sons, Albion Mills, plan £1 million premises.

Hamilton T.C. Tender: 122 Udston-Hill-house houses and garages. Burgh Architect.

Harrogate. I.C.I. Fibres Division, Hookstone Rd, plan £1 million development.

Hebburn. J. M. Angus, 3 Gallowgate, Newcastle, architect for Toner Ave British Legion club.

Heckmondwike. Samuel Jackson and Son, Ocean Chambers, Piccadilly, Bradford 1, architects for £110,000 grammar school extension scheme for West Riding E.C.

Holmfirth U.D.C. Tender: 10 Netherfield Estate bungalows. P. N. Brown and Son, Market Pl.

Hornchurch. F. G. Broadbent and Partners, Kirkland Hse, Whitehall, S.W.1, architects for £260,000 St. Ignatius Roman Catholic School, Wingletye La.

Inverness C.C. Tender: 36 Caol houses, near Fort William. Architect.

Kendal. Manchester Hospital Board, Cheetwood Rd, plan new theatre and boiler-house, Westmoreland County Hospital.—£30,000 Rodgett Infirmary, Lancaster, kitchen, etc.

Kingswood U.D.C. Tender: 42 houses and flats, Pound Rd. Clerk.

Larne B.C. Mill St re-development planned including 46 dwellings.

Limavady R.D.C. 52 houses and garages planned, £86,000.

London. Tunnel Glucose Refineries, Tunnel Ave, Greenwich, S.E.10, plan 800-ton maize silo.—Tooley and Foster, Midland Bank Chambers, Queen's Rd, Buckhurst Hill, architects for £425,000 five-storey building for Royal Northern Hospital, Holloway.—Cecil F. Baker and Partners, 20 Lowndes St, S.W.1, quantity surveyors for re-development of St. Giles Hospital, Camberwell.—E. W. Palmer and Partners, 8 The Town, Enfield, architects for Manor Hse Hospital extensions, North End Rd, N.W.11.—Geo. Davies and Webby, 112 Jermyn St, S.W.1, architects for 13-storey hotel planned for South Bank. Cost £3 million.—T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1, architects for 22-storey Bayswater Rd hotel.—Lamb, Biel and Partners, 16 Bryanston St, W.1, architects for 12-storey Bayswater Rd hotel.—S. Gordon Jeeves, 61 Catherine Pl, S.W.1, architects for 12-storey Bayswater Rd flats. —L. G. Dight, 35 Portland Pl, architects for £100,000 Atlas Securities, Lower Sloane St flats and shops.—Joseph, 10 Lowndes Sq, S.W.1, architects for £200,000 luxury flats, 1-5 Lowndes Sq.—Tender: Cromwell Curve air terminal. Sir John Burnet, Tait and Partners, architects.—Holland and Hannen and Cubitts, 1 Queen Anne's Gate, contractors for £500,000 offices on site of London Transport High St. Putney depot.

Maidstone. Frank Batty and Smith, 18 Spring St, W.2, contractors for 4,920 sq ft Factory Holdings Group factory, Park Wood Trading Estate.—Ian Fraser and Associates, 15 Bedford St, W.C.2, architects for further Factory Holdings' Park Wood buildings.

Manchester. Hanover Mills Co., Buxton St, plan two-storey River St workshops/offices.

Middlesbrough T.C. Tender: 20 Pallister Pk and 39 Easterside houses. Engineer.

Middlesex. Anglo-Swiss (Colnbrook), West Drayton, plan Pyle Industrial Estate factory.

Newburn. Taylor Woodrow Construction, Southall, Middx, contractors for £200,000 plant manufacturing works, Newburn, for Aveling-Barford.

Newcastle. L. G. Mouchell and Partners, 24 Claremont Pl, consulting engineers for British Paints old factory/warehouse.—L. J. Couves and Partners, Grainger Chambers, Hood St, architects for Bonded Warehousing Co. Hanover St warehouse.—**T.C.** 15-storey block 90 flats and seven houses, St. Cuthbert's Rd. Fenham. Architect.

N. Riding C.C. Whitby Fire Station additions planned. Architect. — Tenders shortly for George Pindar Modern School, architects: Collins, Melvin, Ward and Ptnrs, 15 Manchester Sq, W.1.

Peterlee. Tender: Junior R.C. school, Westway. Architect: D. Brown, 10 Lambton Rd, Jesmond, Newcastle.

Plymouth. Associated Portland Cement Manufacturers Ltd., Portland Hse, Tothill St, S.W.1, plan £2 million rebuilding and extension of Plymstock Wks.

Pontardawe R.D.C. Tender: 26 Rhos dwellings. Engineer and Surveyor.

Ponteland. Lillie and Co., Armstrong St, Gosforth 3, contractors for Cordar Roof Lights new factory.

Preston. U.K. Atomic Energy Authority, 11 Charles II St, S.W.1, plan £500,000 Springfield uranium recovery plant.

St. Helens. Triplex Safety Glass Co. plan £1 million expansion plan affecting mostly the Eccleston and King's Norton factories. London office, 1 Albemarle St, W.1.

Scarborough. Additions to Convent of the Ladies of St. Mary, St. Thomas St, planned by Mother Superior.

Seaham U.D.C. Tender: 64 two-storey flats, Station Rd. Engineer and Surveyor.

Shrewsbury. Birmingham Hospital Board plan £27,925 Copthorne Hospital temporary out-patients' department.

S. Shields. Page, Son and Hill, 67 King St, architects for £120,000 Dyeworks Ltd. extensions.

Stockton-on-Tees. Fox and Co., High Barnes Wks, Sunderland, plan 62 Norton Hill houses.

Sunderland. L. J. Couves and Ptnrs., Grainger Chmbrs, Hood St, Newcastle, architects for J. A. Jobling and Co. factory extensions.—**T.C.** Humbledon training centre planned. Architect: H. C. Bishop, Grange Hse, Stockton Rd.

Wakefield T.C. Tender: 12 Ivy Hse Estate bungalows. Engineer.

Wandsworth B.C. Installation of 14,000 socket outlets in 2,862 dwellings proposed.

Wantage U.D.C. Tender: 20 bungalows. Architect.

Wigan. Blue Printers plan Leyland Mill, Haigh, factory extensions.

Wigton. ITA plan Brocklebank TV stn.

Woebley R.D.C. Tender: 32 housing units, Burton Wood. Clerk.

Woking U.D.C. Tender: 52 maisonnettes in four storeys. Engineer and Surveyor.

Wrexham. Air Products (Gt. Britain), St. Giles Hse, Poland St, W.1, plan £100,000 Acrefair extensions scheme.

Overseas

Pakistan. Union Electric Co., 1 Bull Rd, Lahore, require ½ to 100 h.p. a.c. motors, switches, starters, etc., on a sole agency basis.

Company Meeting

Telephone Rentals LIMITED
OPERATING TR SERVICES

ANOTHER SUCCESSFUL YEAR

Volume of New Business Again a Record

MR. W. STUART PHILCOX'S STATEMENT

THE thirty-first annual general meeting of Telephone Rentals Ltd. was held on 8 June at the Registered Office, 197 Knightsbridge, London S.W.7, Mr W. Stuart Philcox, D.F.C., M.A. (chairman and managing director), presiding.

The following is an extract from the statement by the chairman which had been circulated with the report and accounts for the year ended 31 December, 1959:

Before commenting on the results of the year under review, I must refer to the loss we have suffered through the death, on 14 August, 1959, of the founder of our business, Mr Fred T. Jackson.

It would be almost impossible in a few sentences to pay adequate tribute to the qualities of this man. We have therefore sent to each shareholder a copy of the memorial issue of our T.R. Journal which demonstrates as no words of mine could do the remarkable esteem and high regard in which he was held by so many both inside and outside your company.

Telephone Rentals has a very strongly developed family spirit and it as the head of a family that we shall miss him most.

The Year's Trading

I am very glad to be able to report that once again your company has had a very successful year. In this country, in spite of increased competition, the amount of new business we did was again a record. Not only was there an increase in the total number of contracts both with new and existing subscribers, but the number of contracts for large installations included in the total was considerably greater, whilst the business was widely spread over the full range of T.R. Services.

This success was, of course, largely due to the upsurge in industrial production which developed throughout the country during the course of the year, but it also reflected the concentrated attention paid to training and instruction on the sales side in recent years.

Our subsidiary company, Electro Rentals Ltd., which deals solely with refrigeration on rental, has continued to make steady progress. Certain changes in its sales policy may well lead to an accelerated rate of growth in the future.

Overseas

I can also report that our overseas companies have continued to make satisfactory progress. Although these companies still form a relatively small part of our total enterprise, they are growing rapidly and will undoubtedly make a valuable contribution to the strength of the organisation. Trading conditions obviously fluctuate from time to time in any one country, including Great Britain, and these overseas operations will add to the stability of your company.

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Trading income is up by £204,691, Dividends and Interest receivable by £30,656, whilst on the other side Operating Expenses are up by the moderate sum of £16,688, Directors' Emoluments by £21,925 and Depreciation by £30,524.

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The report and accounts were adopted.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Carowe Electrical Co. Ltd. Mr H. B. Britcliffe, 15 Avenue Parade, Accrington, appointed liquidator at extraordinary general meeting on 1 June.

Miller Kent Decoratives Ltd. Muriel Harris appointed liquidator at extraordinary general meeting on 1 June. Creditors to send details to liquidator at 10 Adam St, Adelphi, W.C.2, by 22 June. Formal notice, all creditors to be paid in full.

Lamberts (Farnham Rd) Ltd. Mr G. Talfourd-Cook, 64/65 St. Mary's Butts, Reading, and Mr R. A. Hawken, Bank Chmbrs, 1 John St, Bedford Row, W.C.1, appointed joint liquidators at extraordinary general meeting on 3 June.

Brown and Hicks (Electrical) Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 22 June, at 10.15 and 10.45 a.m., respectively.

Estreich Electrical Co. Ltd. Mr S. Primost, 65 London Wall, E.C.2, and Mr A. W. Hunter appointed joint liquidators as from 17 May.

Rye Electrics Ltd. Mr R. A. Hawken, Bank Chmbrs, 1 John St, Bedford Row, W.C.1, appointed liquidator at extraordinary general meeting on 24 May.

L and K Electrical Installations Ltd. Winding-up order dated 30 May.

W.E.K. (Electrical) Ltd. Last day for receiving intended dividend to preferential creditors: 18 June, to liquidator: J. M. M. Torquil, 4 Bucklersbury, E.C.4.

Companies Winding-up

Refrigeration (Southend) Ltd., refrigeration engineers. The Assistant Official Receiver informed the recent meeting of creditors that according to his information there were liabilities of £23,307, of which £1,006 was preferential, £5,500 due to a debenture holder, £5,000 to a director for loans, about £11,000 to ordinary unsecured creditors with the possibility of a contingent debt of £10,000 in respect of h.p. agreements. Assets valued at £17,413 comprised: stock, £10,000; £3,663, book debtors; £2,300, motor vehicles; £1,350, work in progress; and £100, furniture and fittings.

The company, formed in 1956, at first did not employ any staff or have any premises, its business being restricted to the sale of commercial refrigerators. Later the company acquired premises at 238 Station Rd, and 52 Whitefriars Cres, Westcliff; travellers and engineers were employed and a showroom opened at Station Rd for domestic refrigerators and washing machines, subsequently two more premises were acquired.

Early in 1959 the company became liable for about £4,000 under recourse agreements and that, coupled with the fact that capital was tied up in contracts, meant that it was unable to meet an unexpected demand for payment by a large supplier about June of last year; the supplier later obtained judgment. In March last a debenture holder appointed a receiver and he terminated the company's business.

Creditors passed no resolution and the case was left with the Official Receiver as liquidator.

BANKRUPTCY ACTS

Receiving Orders

High Court of Justice. H. I. Saffer, dealer in electrical appliances, formerly carrying on business at 91 Tabernacle St, E.C.2, and as H.S. Appliances, at 158 Stoke Newington Church St, N.16. Receiving order dated 1 June.

Derby. W. B. Brookes, electrical contractor, formerly carrying on business at 147 Chellaston Rd, Shelton Lock. Receiving order dated 2 June.

Croydon. A. J. D. Copper and R. W. Hutchings, electrical domestic retailers, carrying on business together as Roydon Domestix, at 24 Lewisham Rd, S.E.13. Receiving order dated 31 May.

Public Examination

Croydon. R. A. G. Newman, electrical dealer, formerly carrying on business as Nordon Electrics at 109 Stanstead Rd, Forest Hill, S.E.23. Public examination: 11 a.m., 15 Sept., at County Court, Scarbrook Rd, Croydon, Surrey.

Appointment of Trustees

High Court of Justice. C. W. G. Gunther, F. G. M. Gunther and P. G. Bowen, electrical retailers, formerly carrying on business as Grove Electrical Appliances and Grove Electrics at 758 Fulham Rd, S.W.6. Mr R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1, appointed trustee as from 26 May.

Bradford. D. Cornish, electrical engineer and contractor and hardware retailer, carrying on business as Cornish and Graham at 6/8 Maperton Rd, Bradford 3. Mr G. E. Rushton, 36 North Parade, Bradford, appointed trustee as from 31 May.

Intended Dividends

Brighton. A. Banoff, electrical and radio engineer, formerly trading as Almyn Radio Electric Co., at 111 Church Rd, Hove. Last day for receiving proofs for intended dividend: 18 June, to trustee: T. H. Parker, 8 Old Steine, Brighton 1.

Manchester. F. Jones and B. P. Callaghan, electrical engineers and sheet metal workers, formerly carrying on business in partnership as Jones and Callaghan, at 2 Farm Yard, Levenshulme. Last day for receiving proofs for intended dividend: 17 June, to trustee: W. H. Meredith, 20 Byrom St, Manchester 3.

Dividend

Liverpool. G. Dickinson and K. G. Dickinson, electricians, carrying on business as G. and K. G. Dickinson, at 134 Clipsley La and 321 Church Rd, Haydock. Dividend per £: 5s, payable at 5 Rumford Pl, Liverpool 3, on 30 June.

MEETINGS TO NOTE

MONDAY, 20 JUNE

ELECTRICAL CONTRACTORS' ASSOCIATION annual conference opens at Scarborough. Till 21 June.

A.S.E.E. (Bristol and West Branch). A.G.M. Grand Hotel, Bristol. 7.45 p.m.

WEDNESDAY, 22 JUNE

INSTITUTE OF SEWAGE PURIFICATION. "Fuel Cells and Their Potentialities for Power Generation from Sludge Digestion Gas," Dr H. H. Chambers. Paper from annual conference at Scarborough from 21 to 24 June.

THURSDAY, 23 JUNE

I.E.E. Conversazione, Royal Festival Hall. 7.30 p.m.

A.S.E.E. (S. London Branch). "Heat Storage," R. Jackson. Greyhound Hotel, High St, Croydon. 8 p.m.

SATURDAY, 25 JUNE

INTERNATIONAL MACHINE TOOL EXHIBITION at Olympia until 8 July.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Alcoa International (U.K.) Ltd., 2 Portman St, W.1. To promote the sale of all metals, articles, goods and products manufactured or sold by Aluminum Company of America or Alcoa International Inc., etc. Nom. cap.: £100. Dirs.: Du Bose Avery and David C. F. Pearson.

C. Boocock (Electrical) Ltd. Nom. cap.: £1,000. Dirs.: Herbert Boocock, 210 Skinton Rd, Colne, and Cecil Boocock, Sunny Brae, Manor Rd, Colne.

Bi-Tapes Ltd., 199 Piccadilly, W.1. Electronic engineers, tape recorder maintainers and repairers, etc. Nom. cap.: £100. Dirs.: Richard T. Sherren.

Bradford Electrical (Edenbridge) Ltd., 124/6 High St, Edenbridge, Kent. Nom. cap.: £1,000. Permt. dirs.: Reginald A. G. Bradford and Herbert G. Edwards.

R. Carley and Co. (Eng.) Ltd., 131a Church St, Little Lever, Bolton. To carry on business of mechanical, marine, electrical and general engineers, etc. Nom. cap.: £2,500. Dirs.: Ronald Carley and Mrs H. Carley.

Clayton Temperature Ltd. Mechanical engineers, iron founders and manufacturers of heating, cooling, refrigeration and air-conditioning equipment, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: Gladys Crout and Marion Simmons, 59/67 Gresham St, E.C.2.

Dabell and Sharratt Ltd., The Forest, Forest Grove, Mount Hooton Rd, Nottingham. Electrical, radio and television engineers, etc. Nom. cap.: £1,050. Dirs.: Kenneth Dabell and Ronald P. Sharratt.

Dolphin Electrical Co. (Boston) Ltd., 16/18 Dolphin La, Boston. Nom. cap.: £3,000. Dirs.: Frank A. Harden, Michael B. Harden, Barrie J. Richardson and David J. Goulder.

Gimbals Ltd., 23/27 Bath La, Newcastle upon Tyne. Manufacturers of and dealers in artificial lighting apparatus, etc. Nom. cap.: £100. Dirs.: Maurice Levey and Hetty Levey.

Oakridge Equipment Ltd. Electrical, mechanical and general engineers, etc. Nom. cap.: £1,000. Dirs. not named. Subs.: G. L. Law and G. B Inglis, 18 Austin Friars, E.C.2.

P.L.D. (Electrical) Ltd., "Westwood," New Platt La, Goostrey, Ches. Manufacturers of and dealers in refrigerators, washing machines, etc. Nom. cap.: £600. Dirs.: Geo. E. Dale and Chas B. Large.

H. E. Porte Ltd., 194 Uxbridge Rd, Feltham, Middx. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £100. Dirs.: Henry E. Porte and Mrs W. H. Porte.

Red Squirrel Industries Ltd., Mill Hse Wks, Mill St, Slough, Bucks. Mechanical, electrical, chemical and nuclear engineers, etc. Nom. cap.: £100. Dirs.: Gabriel Hougham and Mrs Eva M. Hougham.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Biclef. 797,970. Class 9. Covered wire and cables. Wandleside Cable Works Ltd., 106 Garratt La, S.W.18.

Cosistat. 802,582. Class 9. Thermostats. Drayton Regulator and Instrument Co. Ltd., Horton La, West Drayton, Middx.

Denmore. 792,911. Class 11. Installations for lighting, heating, etc. Denham and Morley Ltd., Heddonia Hse, 374 Euston Rd, N.W.1.

Hipol. 782,502. Class 9. Capacitors. Dennison Developments Ltd., 222 Soho Hill, Handsworth, Birmingham 19.

Iwo and **Elektro Iwo.** 794,021/2. Class 11. Refrigerators, refrigerated display cabinets, etc. Elektro Iwo Aktiebolag, Hanlverkargatan, Mariestad, Sweden.

Varamag. 792,997. Class 9. Transformers, magnetic amplifiers, etc. Lancashire Dynamo Nevelin Ltd., Holland Rd, Hurst Green, Oxted, Surrey.

the proved plant for D.C. industrial supply

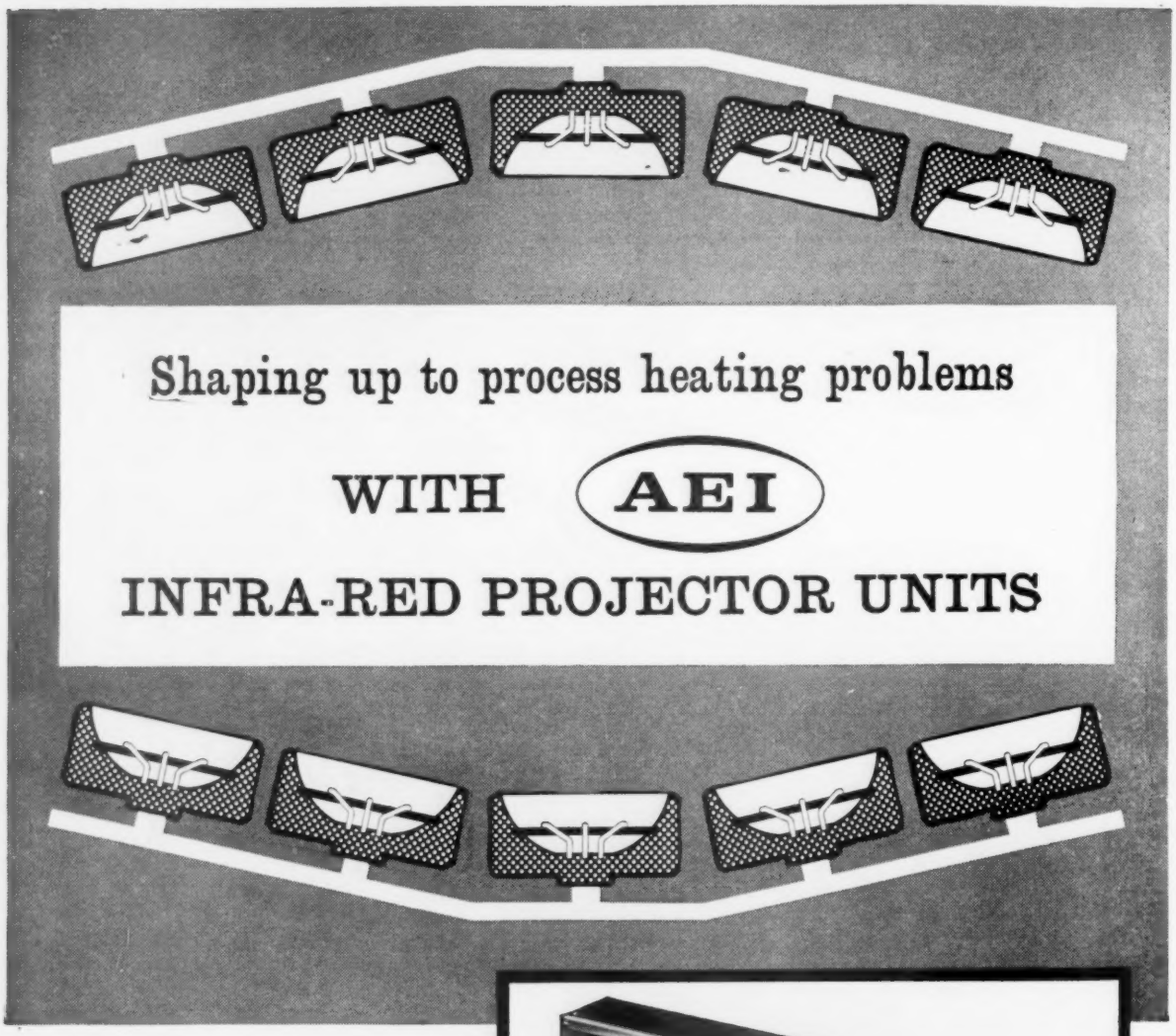
Hewittic Rectifiers

REGD. TRADE MARK

Pumpless, air cooled, Hewittic Rectifiers are supplied up to any capacity for the operation of steel mills and other heavy industrial plant, or in small units for such applications as battery charging. They are ideal for replacing obsolete rotary converters or local D.C. generating equipment, and provide a greater D.C. output in the same floor space.

The illustration shows one of three Hewittic Rectifier substations each providing an output of 7,826 amps for supplying machinery employed in continuous process work. Because of the very high load factor these equipments have been rated in accordance with Class V B.S.S. 1698. Photograph by courtesy of I.C.I. Ltd.

HACKBRIDGE & HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES, SURREY, ENGLAND
Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"



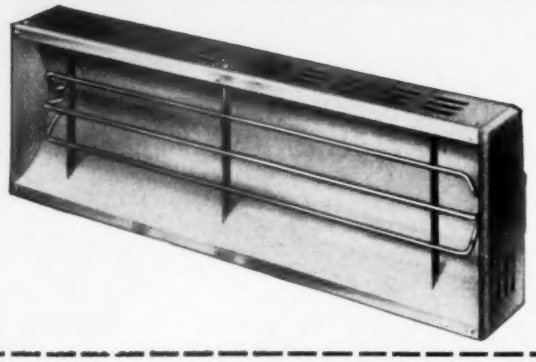
Shaping up to process heating problems

WITH AEI

INFRA-RED PROJECTOR UNITS

With these specially designed projector units you can build an electric infra-red plant to suit your processing needs exactly. They incorporate tubular sheathed elements and highly efficient anodised aluminium reflectors, and can be readily erected in banks, portable units or used end to end in continuous troughs. They are eminently suitable for building into existing machines.

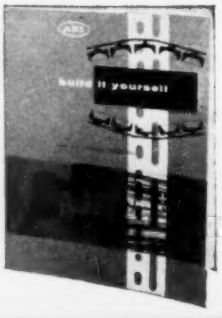
Units are available ex stock in convenient standard lengths of 18in., 24in. and 36in., with ratings from 1.5 kW to 4 kW. Other special units including high intensity types are available in sizes ranging from 12in. to a maximum of 10ft 6in. long.



Send for

A E I LEAFLET NO. 1864-81

entitled 'Build It Yourself,' giving a wide range of examples of successful applications.



Associated Electrical Industries Limited

TRANSFORMER DIVISION — HEATING & WELDING DEPARTMENT

Trafford Park - - - Manchester 17

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

County Borough of Bournemouth
BOURNEMOUTH MUNICIPAL COLLEGE OF TECHNOLOGY AND COMMERCE
PRINCIPAL: M. L. YATES,
M.A.(COM.), M.SC.(TECH.), PH.D., M.I.MECH.E.

FULL-TIME and part-time courses are provided in preparation for the following:

B.Sc. General (New Regs.) (Chemistry, Physics, Biology, Mathematics).
B.Sc. Engineering (Electrical, Mechanical).
B.Sc. Economics (Accountancy, Government, Industry and Trade).
(All the above are University of London External Degrees.)
Higher National Diploma Sandwich Course in Mechanical Engineering Accountancy.

Provision is made for students' social and athletic interests.

Applications for admission should be addressed to The Principal, from whom any further particulars required may be obtained. Telephone Bournemouth 20844-5.
(R 152)

TENDERS INVITED

TAF FECHAN WATER SUPPLY BOARD
ELECTRICAL CONVERSION FROM D.C. TO A.C.

TENDER documents are being prepared for the conversion, from D.C. to A.C., of the electrical installation in the Treatment Works of the Taf Fechan Water Supply Board at Pontsticill, near Merthyr Tydfil, South Wales.

Firms interested in submitting tenders for specific items of the works listed below are invited to apply to the Board's Consulting Engineers, Messrs Binnie, Deacon and Gourley, Artillery Hse, Artillery Row, London S.W.1, to be considered for inclusion on a list of invited tenderers.

1. Complete overhaul and conversion, from D.C. to A.C., of existing goods lift.

2. Supply only of two self-priming water pump sets, complete with motors; capacity 500 g.p.m. against 50 ft head.

3. Supply only of two air compressor sets, with slip-ring motors; capacity 50 cu ft per minute at 100 p.s.i.

4. Supply only of 415 V T.P. and N. switchboard comprising one 150 amp circuit-breaker, motor starters up to 15 h.p., and sundry switch-fuses.

5. Supply only approximately 250 yds of 3¼ core 0·1 sq in. P.I.L.C.S.W.A. cable and cable cover tiles.

6. Supply only of several small geared motor units.

7. Supply and installation of one 50 kW water turbine alternator set, complete with switchboard.

8. Supply and installation of all cabling, etc., for the rewiring of existing equipment and the wiring of new equipment. Note: Interested firms must be on the Roll of Approved Electrical Installation Contractors.
(R 168)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division
SENIOR DRAUGHTSMAN (ELECTRICAL)

REQUIRED in the Electrical Department at Divisional Headquarters, Bristol.

Superannuation Scheme. Salary: N.J.B., Schedule D, Grade 4, £930/£1,030, or Grade 5, £790/£890 per annum, according to qualifications and experience.

The successful candidate will be required principally to prepare electrical layout drawings for outdoor grid substations, but general adaptability is considered important. Technical education to H.N.C. is desirable. Quote Vacancy ET/AV/78/60. Closing date 25 June, 1960.

Previous applicants will be reconsidered.

FOURTH ASSISTANT ENGINEER

Required in the Taunton District of the Electrical Department.

Superannuation Scheme. Salary: N.J.B. Class AX/DX, Grade 7, £840—£965/£1,040 per annum.

Duties in the first instance will be the supervision of overhead line construction up to 275 kV and later substation erection. Subsequently the duties will include commissioning and maintenance.

Candidates should hold qualifications leading to Corporate Membership of one of the major Engineering Institutions. Quote Vacancy ET/AV/77/60. Closing date 23 June, 1960.

Applications on form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date stated. (R 172)

SOUTH EASTERN ELECTRICITY BOARD
SENIOR SALES REPRESENTATIVE
DORKING AND EPSOM DISTRICT

SALARY £640 x £20—£700 per annum under N.J.C. Grade 2. Superannuable. The person appointed will be required to give advice on supply matters, tariffs and appliance sales and installations for domestic and small commercial consumers. Applicants must be thoroughly conversant with all types of domestic electrical appliances and in addition to acting as an outside representative, must be prepared to carry out general showroom duties in any showroom within the Dorking and Epsom District. Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, 56 South St, Dorking, by 29 June, 1960.

ASSISTANT DISTRICT ENGINEER
HASTINGS DISTRICT

Salary £765 x £15—£810 under N.J.B. Class F, Grade 10. Preference to applicants with technical qualifications up to H.N.C. standards and with practical experience of the operation, maintenance and construction of MV and 11 kV underground and overhead systems. The successful candidate will be expected to reside in or near Hastings. Applications, quoting ET and naming two referees, to District Manager, Seeboard, 12/13 York Bldgs, Hastings, Sussex, by 29 June, 1960.

GEORGE WRAY,
Secretary.
(R 173)

CITY OF LEICESTER EDUCATION COMMITTEE
LEICESTER COLLEGE OF TECHNOLOGY AND COMMERCE
PRINCIPAL: R. E. WOOD, M.SC., F.INST.P.

APPLICATIONS are invited for the post of ASSISTANT (GRADE B) in the Department of Electrical Engineering for Ordinary National Certificate and City and Guilds of London Institute Electrical Installation and Electrical Fitters' courses. Candidates should possess a Higher National Certificate in Electrical Engineering, or appropriate Final City and Guilds Certificates, with suitable industrial experience and, preferably some teaching experience.

Salary: Burnham Technical Scale £700/£1,150 per annum with appropriate allowance for approved qualifications, industrial and/or teaching experience.

Form of application and further particulars can be obtained from the Registrar, College of Technology and Commerce, Leicester, to whom completed forms should be returned as soon as possible. (R 174)

THE SOUTH WALES ELECTRICITY BOARD
ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Mid-Wales and North Monmouthshire District (Brecon) in the Monmouthshire and Mid-Wales Area of the Board.

The successful applicant will be employed on planning, operational and constructional duties within this extensive rural district of 1,180 square miles, and will obtain considerable experience in the development of a rural supply network.

The salary for the position will be in accordance with Class E, Grade 9 (£765/£810), of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Albany Chmbrs, Skinner St, Newport, Mon, so as to arrive not later than Saturday, 9 July, 1960.

Envelopes should be endorsed "Assistant Engineer—69/60."

R. G. WILLIAMS,
Secretary.
(R 192)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Project Group
THIRD ASSISTANT ENGINEER (PROGRAMMES)

APPLICATIONS are invited for the appointment of Third Assistant Engineer (Programmes) in the Midlands Project Group at Bournville. Applicants should preferably possess a Higher National Certificate in either Mechanical or Electrical Engineering and have served a recognised engineering apprenticeship.

The selected candidate will be required to assist in the preparation of detailed programme charts for complete power station projects, including contract procedure, manufacture, site construction and commissioning.

The salary will be within Grade 5 (£1,090/£1,300 per annum) of Schedule C of the National Joint Board Agreement.

Applications should be made on standard form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham, should be returned to him not later than 27 June, 1960.

Envelopes should be marked "Confidential Staff Vacancy Notice No. MPG.45/60."
(R 156)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions at Willington Power Station, P.O. Box 27, Derby

ASSISTANT ENGINEER
(ELECTRICAL MAINTENANCE)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 147/60.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 9 (£1,195/£1,270 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT ENGINEER (INSTRUMENTS)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 148/60.

Candidates should have had a sound technical training and have a good practical knowledge of the construction, repair and testing of power station instruments and automatic controls. Knowledge of electronic and other modern forms of instrumentation and controls will be an advantage.

Salary will be in accordance with Class M, Grade 10 (£1,095/£1,170 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT ENGINEER (COAL AND ASH)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 149/60.

Candidates should have knowledge of the operation of coal, ash and dust handling plant at a large modern power station, and of the organisation and planning of coal supplies by road and rail.

Experience of dust disposal by pipeline would be an advantage, and the duties of the successful candidate will include the organisation of ash disposal by lorry transport.

Salary will be in accordance with Class M, Grade 11 (£1,025/£1,085 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT ENGINEERS
(PLANNING AND EFFICIENCY)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 150/60.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates with Higher National or degree qualifications in Electrical and/or Mechanical Engineering. Applicants should state their preference for Planning Section or Efficiency Section.

Salary will be in accordance with Class M, Grade 8 (£1,270/£1,360 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

SECOND ASSISTANT STATION CHEMIST
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 151/60.

It is desirable that applicants have a University Degree or Associateship of the Royal Institute of Chemistry and experience in general chemical analysis, with particular experience in the use of physico-chemical apparatus such as U.V. Spectrophotometer, and a knowledge of statistical methods.

Salary will be in accordance with Class M, Grade 11 (£1,025/£1,085 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

SHIFT CHARGE ENGINEERS
WILLINGTON "B" POWER STATION

Vacancy No. 152/60.

Candidates should have had a sound technical training and considerable experience in a modern power station. Preference will be

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given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications, and a knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class K, Grade 6 (£1,270/£1,360 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT SHIFT CHARGE ENGINEERS
WILLINGTON "B" POWER STATION

Vacancy No. 153/60.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,095/£1,170 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT ENGINEER
(MECHANICAL MAINTENANCE)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 154/60.

Applicants should have had considerable experience in the Mechanical Maintenance of large modern power stations. Technical qualifications to Higher National Certificate standard in Mechanical Engineering, or equivalent.

Salary will be in accordance with Class M, Grade 8 (£1,270/£1,360 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

ASSISTANT ENGINEER
(MECHANICAL R. AND M.)
WILLINGTON "A" AND "B" POWER STATIONS

Vacancy No. 155/60.

Applicants should have received a sound technical training and have had wide practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 6 (£1,470/£1,575 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 24 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 160)

SIERRA LEONE GOVERNMENT

STATION SUPERINTENDENTS

REQUIRED by Electricity Department on contract for two tours of 18/24 months each in first instance Gross salary according to experience in scale £1,210 rising to £1,528 a year. Gratuity at rate 15% of total salary drawn. Outfit allowance £60. Children's allowances £48/£288 a year. Free passages for officer, wife and three children under 18 years. Liberal leave on full salary. Candidates, between 21-40 years of age, must have served full apprenticeship with an electrical engineering company and have had several years' experience of operation and maintenance of power stations in a responsible position. They should preferably hold M.O.T. Cert. (Steam and Diesel) or equivalent. Good knowledge of power station electrical equipment desirable. Newly qualified Mechanical Engineers with some practical experience in steam turbines and diesel engines will also be considered at minimum of salary scale. Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/50789/EE. (R 158)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a FOURTH ASSISTANT ENGINEER (PROTECTION) in the Technical Section of the Chief Engineer's Department at Board Headquarters.

Candidates should possess a Degree or Higher National Certificate in Electrical Engineering and should preferably have had some experience in commissioning high voltage electrical apparatus and routine maintenance and testing of protective gear. Previous experience at the works of a manufacturer would be an advantage. The scope of the work embraces equipment in the Board's generating stations and transmission system.

Salary: N.J.B. Schedule B, Class AX/EX, Grades 7 and 8, £840/£1,065 or £735/£960.

Applications on the standard form and quoting reference E22/60 available from the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, should be returned not later than 1 July, 1960.
(R 155)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

STATION SHIFT CONTROL ENGINEER
DERBY POWER STATION

Vacancy No. 143/60.

APPLICATIOINS are invited for the position of Station Shift Control Engineer at Derby Power Station, Full St, Derby.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be an advantage.

Salary will be in accordance with Class F, Grade 10 (£765/£810 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications: 24 June, 1960.

PLANT SHIFT CONTROL ENGINEER
WILLINGTON "A" POWER STATION

Vacancy No. 146/60.

Applications are invited for the position of Plant Shift Control Engineer at Willington Power Station, P.O. Box 27, Derby.

Applicants should have had a sound technical training and experience of the operation of a power station, including electrical control room experience.

Preference will be given to candidates who possess technical qualifications to Higher National Standard, and experience of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class L, Grade 10 (£1,025/£1,085 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 24 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 161)

COUNTY OF LANARK

CHIEF TECHNICAL ASSISTANT

REQUIRED for County Lighting Department at Hamilton with experience in design, erection and maintenance of public lighting installations. Applicants must be either corporate members of Institution of Electrical Engineers or hold final examination certificate of City and Guilds in Illuminating Engineering.

Salary Scale £795/£1,075 with placing according to qualifications and experience.

Superannuation. Medical examination. No canvassing.

Application form from County Clerk, P.O. Box No. 1, Glasgow, and should be returned by 22 June, 1960. (R 142)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. Applications stating age, qualifications, present position and salary, previous experience and quoting the vacancy number should reach the appropriate Manager within 14 days of the date of this advertisement.

Lincolnshire Sub-Area :

SERVICE CENTRE SUPERVISOR
LINCOLN DISTRICT
Vacancy No. 74/60.

Salary: N.J.C. Grade 5, £885 x £25—£960 per annum.

Candidates should:

(a) have had experience in the operation of a busy Service Centre, supervision of sales staff, planning window displays, sales activity programmes and should be able to advise consumers on tariffs and supply matters in general: or

(b) have had general experience in a Sub-Area or District Commercial Department of an Area Board, and be keen to broaden their knowledge and experience of the commercial activities of an Area Board.

Applications should be sent to the Manager, Lincoln District, Brayford Side North, Lincoln.

Nottingham Sub-Area :

SENIOR ASSISTANT (PURCHASING)
Vacancy No. 56/60.

Salary: N.J.C. Grade 5, £885 x £25—£960 per annum.

The successful applicant will be responsible to the Sub-Area Secretary for all aspects of work in connection with purchasing, records, returns and statistics, including correspondence, of the Sub-Area Purchasing Section.

Applicants should have had experience in purchasing stores and equipment associated with Electrical Distribution work, Service Centre sales and Office Supplies, and should be capable of working on their own initiative.

Applications should be sent to the Manager, Nottingham Sub-Area, 35/39 Carrington St, Nottingham.

Coventry Sub-Area :

THIRD ASSISTANT DISTRICT ENGINEER
Vacancy No. 76/60.

Salary: N.J.B. Class G, Grade 9, £860 x £15—£905 per annum.

Candidates should have practical experience in the construction, operation and maintenance of underground distribution systems up to and including 11 kV. Ability to drive a motor vehicle is essential, and the successful candidate will be required to reside in Coventry and to undertake standby duties at some future date.

Applications should be sent to the Manager, Coventry Sub-Area, Sandy La, Coventry. (R 181)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

SUB-AREA HEADQUARTERS, BEDFORD
SECOND ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
(145/60.R)

Candidates should have had a wide experience in the design, layout and operation of urban and rural distribution systems comprising overhead and underground networks (including substations) at voltages up to and including 33 kV. They should be experienced in the preparation of distribution schemes including the technical design, specification and estimates. Corporate Membership of the Institution of Electrical Engineers or the possession of a degree in electrical engineering will be an advantage.

Salary: N.J.B. Class L, Grade 7 (£1,270/£1,360).

Apply by letter to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend St, Bedford, by 1 July, 1960.

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Northmet Sub-Area

SUB-AREA HEADQUARTERS, LONDON, N.14
FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
(Ref. 978) (147/60.R)

The duties include the commissioning and testing of system protection, automatic control and communications equipment. Whilst some previous experience is desirable candidates who lack this experience but have a good technical background will be considered.

Salary: N.J.B. Grade 13 (£965/£1,025) plus London Allowance.

Apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet Hse, Southgate, London N.14, by 27 June, 1960.

HERTFORD DISTRICT
GENERAL ASSISTANT ENGINEER
(Ref. 962) (146/60.R)

Candidates should have had a good general and technical education and possess the Higher National Certificate or an equivalent qualification.

Salary: N.J.B. Class G, Grade 12 (£710/£755).

Apply by letter to W. H. Hatton-Ward, ASSOCIATE I.E.E., A.M.B.I.M., Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts, by 27 June, 1960.

Suffolk Sub-Area

COLCHESTER DISTRICT
THIRD ASSISTANT ENGINEER
(148/60.N.)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems (including substations) at voltages up to and including 33 kV. Knowledge of D.C./A.C. changeover an advantage.

Salary: N.J.B. Class F, Grade 9 (£815/£860).

The successful candidate will be required to reside within reasonable proximity of Colchester.

Apply by letter to G. P. Dixon, A.M.I.MECH.E., Manager, Colchester District, Eastern Electricity Board, 36 Osborne St, Colchester, Essex, by 27 June, 1960. (R 175)

AIR MINISTRY

REQUIRE ASSISTANT MECHANICAL and ELECTRICAL ENGINEERS for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. Five-day week with four weeks' two days' leave a year initially. Special allowance in addition to salary during overseas service. Quals. and experience:

(i) (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship;

or (b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship;

or (c) Graduate or corporate member of I.Mech.E., appreciable electrical engineering experience with at least three years' apprenticeship;

and (ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/OA. (R 21)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

INSTALLATION ENGINEER
EDINBURGH EAST DISTRICT
SALARY: N.J.B. SCHEDULE A, CLASS G, GRADE 9, £860/£905 p.a.

APPLICATIONS are invited for the appointment of an Installation Engineer in the Edinburgh East District and should be submitted to the undersigned not later than 8 July, 1960.

Applicants should have a good knowledge of the organisation and operation of a contracting department, including estimating and costing, and be familiar with domestic, commercial and industrial installation work. Applicants should possess the minimum qualification of the Ordinary National Certificate in Electrical Engineering.

Conditions of service are in accordance with the National Joint Board Agreement for the Electricity Supply Industry and the successful candidate, subject to satisfactory evidence of health, will require to become a contributor to the Board's Superannuation Scheme.

C. H. A. COLLYNS,
Manager.

52 Melville St,
Edinburgh 3.
7 June, 1960. (R 154)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEERS are required at Walsall Power Station for generation operational duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, J14, £710/£755 per annum.

Applicants should have received a sound technical training and preferably have had some industrial engineering experience, and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting Vacancy No. 141/60MD on forms AE6, which are available from the Station Superintendent, Walsall Power Station, Reedswood La, Birchills, Walsall, Staffs, to whom they should be returned when completed not later than 27 June, 1960. (R 171)

CITY OF WAKEFIELD

City Engineer's Department

JUNIOR ASSISTANT ELECTRICAL ENGINEER
GRADE A.P.T.I. (£610 x £30(4) x £35—£765 PER ANNUM)

APPLICATIONS are invited for the above superannuable appointment in the City Engineer's Department.

The successful applicant will be engaged mainly on Street Lighting (maintenance and new installations) and on the supervision of various forms of electrical installations.

Preference will be given to applicants who hold the Ordinary National Certificate in Electrical Engineering and who have had previous experience in street lighting.

Applications stating age, qualifications and experience, together with the names of two referees to be sent to the City Engineer, Town Hall, Wakefield, by 4 July, 1960. (R 159)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (DESIGN)
SUB-AREA ENGINEERING DEPARTMENT
BOLTON

THE duties will include assisting in the design of H.V. and L.V. networks, and programming and progressing constructional work.

Experience in calculations of system load flows, fault levels and relay settings is desirable, and applicants should have had a sound training in electrical engineering to degree or H.N.C. standard.

Salary Scale: £1,025 x £20—£1,085 p.a. Grade L.10. N.J.B. Conditions.

Applications on a form to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 29 June, 1960. (R 148)

South Western ELECTRICITY

SOUTH WESTERN ELECTRICITY BOARD

Vacancies For:

(1) THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), BRISTOL
(2) SENIOR DRAUGHTSMAN, WESTON DISTRICT
(3) THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), TAUNTON
(4) THIRD ASSISTANT DISTRICT ENGINEER (SUPPLY), TAUNTON
(5) BRANCH MANAGER, HONITON, EXETER DISTRICT
(6) THIRD ASSISTANT DISTRICT ENGINEER (CONSTRUCTION), EXETER
(7) FOURTH ASSISTANT DISTRICT ENGINEER (O. AND M.), EXETER
(8) WAYLEAVE ASSISTANT, PLYMOUTH DISTRICT
(9) THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), PLYMOUTH

CLOSING DATE FOR RECEIPT OF COMPLETED APPLICATIONS IS MONDAY, 4 JULY, 1960.

1. THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), BRISTOL

SALARY within Class K, Grade 9, £1,025 x £20—£1,085 per annum of the N.J.B. Agreement.

The successful candidate will be required to assist the District Planning Engineer in the design of E.H.V., H.V. and M.V. systems, fault level and load flow investigations; loading estimates and negotiations with local authorities and architects.

Possession of the Higher National Certificate in Electrical Engineering is essential and the ability to drive a car would be an advantage.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the Group Administrative Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1.

2. SENIOR DRAUGHTSMAN WESTON DISTRICT

Salary within Grade 4, £930 x £20—£1,030 per annum of Schedule D of the N.J.B. Agreement.

Applicants should be experienced Engineering Draughtsmen and Surveyors, and be capable of supervising a drawing office which includes surveying and field records staff. Experience in all classes of drawing work in connection with Electricity Supply is essential, and previous experience in the supervision of staff would be an advantage.

Possession of an Ordinary or Higher National Certificate (Electrical) or (Building) and a current driving licence are desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, 168 Locking Rd, Weston-super-Mare.

3. THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), TAUNTON

Salary within Class G, Grade 9, £860 x £15—£905 per annum of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the District Engineering Department and in planning research and the technical work of a large distribution system on voltages up to and including 33 kV. Duties will include the examination of system loads, preparation of capital applications for reinforcement and new development schemes, system calculations and load forecasting and work in connection with the preparation of the Capital Budget.

Applicants should have a broad technical training and experience of construction and operation of systems up to and including 33 kV and may be required to undertake standby duties. Possession of the Higher National Certificate in Electrical Engineering or its equivalent will be an advantage.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, The Parade, Taunton.

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4. THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (SUPPLY) TAUNTON

Salary within Class G, Grade 9, £860 x £15—£905 per annum of the N.J.B. Agreement.

The successful applicant will be required to give general assistance in the District Commercial Office and duties will include the preparation of Rural Development programmes; assistance with the negotiations of supplies to housing estates, industrial and large commercial consumers; negotiations of street lighting Agreements and assistance to Branches in administrative work connected with these Agreements; development of contracting services throughout the Districts including assistance to Branches with the preparation of specialised tenders.

Possession of appropriate qualifications at least equal to the Higher National Certificate in Electrical Engineering will be an advantage.

Applications to be made on Standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, The Parade, Taunton, Somerset.

5. BRANCH MANAGER HONITON, EXETER DISTRICT

Salary within Class G, Grade 7, £965 x £20—£1,025 per annum of the N.J.B. Agreement.

The candidate appointed will be responsible to the District Manager, Exeter, for the efficient operation of the Branch. Duties include commercial development, consumer service, sales and electrical installation contracting in the Branch area, operation and maintenance of the distribution system and such constructional work as may be delegated. The successful applicant will be required to undertake standby duties.

Technical qualifications equivalent to the Higher National Certificate in Electrical Engineering, an all round Commercial and Engineering experience and the ability to control staff will be an advantage. The possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, 3 Bedford St, Exeter, Devon.

6. THIRD ASSISTANT DISTRICT ENGINEER (CONSTRUCTION), EXETER

Salary within Class G, Grade 9, £860 x £15—£905 per annum of the N.J.B. Agreement.

The successful candidate will be responsible to the Second Assistant District Engineer (Construction) for all types of construction work including H.V. and L.V. O/H lines and U/G cables, the preparation of material schedules, the phasing of work and supply of materials, the efficient supervision of works during construction, utilising labour and mechanical aids to the best advantage, keeping a check on costs, preparing reports and statistics and for the maintenance of progress records. He will be required to carry out standby duty.

Applicants should have had experience in the construction and operation of distribution mains and equipment and should possess a Higher National Certificate in Electrical Engineering or qualifications leading to it. The ability to drive a car and the possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, 3 Bedford St, Exeter.

7. FOURTH ASSISTANT DISTRICT ENGINEER (OPERATION AND MAINTENANCE) EXETER

Salary within Class G, Grade 11, £765 x £15—£810 per annum of the N.J.B. Agreement.

The successful candidate will be required to undertake general duties on the maintenance of the E.H.V., H.V. and L.V. networks and may be required to carry out standby duties.

Applicants should have had some experience in the operation and maintenance of U/G and O/H distribution systems, and

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possession of the Higher National Certificate in Electrical Engineering would be an advantage. The ability to drive a car and the possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, 3 Bedford St, Exeter.

8. WAYLEAVE ASSISTANT PLYMOUTH DISTRICT

Salary within Grade 2, £640 x £20—£700 per annum, of the N.J.C. Agreement.

The duties of the successful candidate will include the acquisition of wayleaves and substation sites and negotiation of claims for damage arising therefrom under the supervision of the District Wayleave Officer; also the maintenance of wayleave records as required by Board procedure.

Previous experience in a similar position, or one involving knowledge of land and agricultural values, and a knowledge of draughtsmanship and of the erection of overhead lines will be an advantage. Possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, Elliott Rd, Prince Rock, Plymouth.

9. THIRD ASSISTANT DISTRICT ENGINEER (PLANNING), PLYMOUTH

Salary within Class G, Grade 9, £860 x £15—£905 per annum of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the planning and technical work relating to construction of substation equipment up to and including 33 kV and also for both overhead and underground systems. The person appointed may be required to undertake standby duty and he will be a Senior Authorised Person.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is necessary and a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, Elliott Rd, Prince Rock, Plymouth. (R 178)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

INSTALLATION ENGINEERS
LANARK AND RUTHERGLEN DISTRICTS

APPLICATIONS are invited for positions as Installation Engineers in the Lanark and Rutherglen Districts.

Applicants should be trained as Electricians with experience in all types of electrical installations and have a knowledge of the testing of installations and be conversant with the Electricity Supply Regulations (1937) and the I.E.E. Regulations for the Electrical Equipment of Buildings. Technical qualifications to Ordinary National Certificate or Higher Standard would be an advantage.

The salary and conditions of service for the appointments will be in accordance with the National Joint Board Agreement, Schedule A. The classification and grading for the respective Districts is as follows:

Lanark, E9, £765/£810.
Rutherglen, G9, £860/£905.

Application forms which may be obtained from the undersigned should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.

Montrose Cres,
Hamilton. (R 170)

LONDON COUNTY COUNCIL

South East London Technical College

LECTURER IN ELECTRICAL ENGINEERING required as soon as possible. Salary within the scale £1,408 x £35—£1,601 according to age and experience.

Application forms from College Secretary (FE3a/ET/1599/6), South East London Technical College, S.E.4, returnable within two weeks. (R 179)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER

REQUIRED at Blaenau Ffestiniog. Salary within range £655/£700 per annum (N.J.B. E/11).

Applicants should have completed a recognised electrical apprenticeship and had some technical training. Duties will include estimating, preparation of specifications and supervision of contracting work, advising consumers on matters relating to electricity supply and the utilisation of electricity. The ability to speak Welsh and to drive would be an advantage.

The work is of an interesting nature, and the post is pensionable, with good working conditions and reasonable future prospects to suitable staff.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham. Closing date: 27 June, 1960.

(R 182)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

SENIOR ASSISTANT ENGINEER
(METERS TESTING AND PROTECTION)

APPLICATIONS are invited from Corporate Members of the Institution of Electrical Engineers for the above vacancy. Ability is required to organise, conduct and supervise the work of the section which includes metering, protection, fault location, communications and supervisory control.

Salary: N.J.B. Class L, Grade 4, £1,600 x £35—£1,705 per annum.

DEMONSTRATOR (FEMALE)

Candidates should have completed a two-year full-time Course in Domestic Subjects at a recognised Training College and should preferably possess the Certificate of the Electrical Association for Women.

Previous experience of demonstrating, particularly within the Electricity Supply Industry, will be an advantage.

Salary: N.J.C. Grade 1, £525 x £20—£625 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, nr. Leeds, not later than 1 July, 1960.

Head Office

THIRD ASSISTANT ENGINEERS
DISTRIBUTION DESIGN (SUBSTATIONS)

The successful applicants will be required to assist with the design of indoor and outdoor substations operating at voltages of 33 kV and above, the preparation of specifications for substation plant, negotiations with plant manufacturers, and inspection of equipment in course of manufacture.

The minimum technical qualifications are the possession of a good Higher National Certificate in Electrical Engineering and Graduate Membership of the Institution of Electrical Engineers.

Applicants should have had a few years' general experience of field construction work and should preferably have some practical knowledge of the construction and erection of substation plant.

The work offers scope for the development of technical knowledge and experience, particularly in respect of switchgear, transformers and protection gear.

Salary: N.J.B. Schedule B, Class AX/EX, Grade 6, £925 x £25—£1,050 rising to £1,170 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 1 July, 1960.

No. 7 (Grimsby) Sub-Area

SCUNTHORPE DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, con-

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struction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary: N.J.B. Class G, Grade 9, £860 x £15—£905.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 1 July, 1960.

No. 1 (Bradford) Sub-Area

OTLEY DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should have passed the Associate Membership Examination of the Institution of Electrical Engineers, or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cable, overhead lines, substations and medium low voltage networks.

Candidates should be prepared to reside within the district and undertake standby duties.

Salary: N.J.B. Class F, Grade 9, £815 x £15—£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 1 July, 1960. (R 176)

THE SOUTH WALES ELECTRICITY BOARD

(A) SECOND ASSISTANT DISTRICT ENGINEER

(B) COMMERCIAL ASSISTANT

Applications are invited for the following positions in the Cardiff and East Central Area of the Board.

(a) Second Assistant District Engineer
Cardiff District

Salary: N.J.B. Class J, Grade 7 (£1,095/£1,170).

Preference will be given to Engineers possessing the H.N.C. in Electrical Engineering.

(b) Commercial Assistant
Barry District

Salary: N.J.B. Class F, Grade 7 (£910/£955).

Preference will be given to Engineers possessing the H.N.C. in Electrical Engineering and who have had experience of engineering and commercial problems of supplies to large and small Commercial and Industrial Consumers.

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff and East Central Area, 445-447 Cowbridge Rd East, Cardiff, to arrive not later than Friday, 8 July, 1960.

Envelopes should be endorsed (a) "Second Assistant District Engineer 123/60"; (b) "Commercial Assistant 124/60."

R. G. WILLIAMS,
Secretary.
(R 140)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited for the undermentioned appointments:

SECOND ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should have had a sound technical education and have obtained a Higher National Certificate or Engineering Degree. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Duties will include load flow and short circuit calculations, the control of system switching operations and the co-ordination of district work to obtain standard methods of construction and maintenance. Previous operational experience in city and rural districts is essential.

Salary will be in accordance with National Joint Board Agreement, Schedule A, Class H, Grade 6, £1,095/£1,170.

SECOND ASSISTANT ENGINEER
(PLANNING)

Educational qualifications should be as for the above-mentioned position.

Applicants should be well experienced in city and rural transmission and distribution planning up to 33 kV. The successful candidate will be required to assess load development and deal with forward planning for distribution.

Duties will include planning of H.V. and L.V. reinforcements, distribution to new high density housing and city redevelopment works, also design of indoor and outdoor substations up to 33 kV.

Salary will be in accordance with National Joint Board Agreement, Schedule A, Class H, Grade 7, £1,025/£1,085.

CLERICAL ASSISTANT
(PROGRESS AND CONTRACTS)

Applicants should be well educated and have had considerable experience in office procedure and methods.

The successful applicant will be employed in the Area Engineer's Department to prepare contract documents and tenders, and to allocate and record plant transfers. Duties will include programming of construction works and the maintenance of records for progress control.

Salary will be in accordance with National Joint Council Agreement, Grade 1 or 2, £525/£625 or £640/£700, according to qualifications and experience.

Applications should be on the standard application form obtainable from the Area Manager, 7 Dudhope Crescent Rd, Dundee, and should be returned by 2 July, 1960.

(R 180)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment:

GENERAL ASSISTANT ENGINEER
SOUTH DENES (GT. YARMOUTH)
GENERATING STATION

Salary N.J.B., Class J, within the range of Grade 17/15, £560 x £15—£700 per annum.

The commencing salary will depend upon the duties and responsibilities.

Duties of the above post include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, quoting Staff Vacancy No. 1338, stating age qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 25 June, 1960. (R 169)

CENTRAL ELECTRICITY GENERATING BOARD
North Eastern and Yorkshire Region

STATION CHEMIST
HUDDERSFIELD POWER STATION

APPLICATIONS are invited for the appointment of Station Chemist at Huddersfield Power Station.

Applicants should hold Higher National Certificate in Chemistry and have had previous power station experience.

The conditions of service and salary will be in accordance with the National Joint Board Agreement, Grade 7, Class F, Schedule A (£910/£955 per annum).

Forms of application may be obtained from the Assistant Regional Secretary (Personnel) Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 30 June, 1960. (R 153)

SOUTHERN ELECTRICITY BOARD

WAYLEAVE OFFICER

SUB-AREA Engineer's Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge. Salary: N.J.C. Grade 2 (£640/£700 per annum, plus London Weighting). N.J.C. Conditions of Service.

The duties of the post will include the ability to negotiate Wayleave Agreements for the erection or laying of electric lines and installation of substations and plant.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1210, not later than 27 June, 1960.

SERVICE REPRESENTATIVE

Ealing District of No. 1 (Southall) Sub-Area. Salary: N.J.C. Grade 2 (£640/£700 per annum, plus London Weighting). N.J.C. Conditions of Service.

Applicants should have a general knowledge of application of tariffs and domestic apparatus, together with ability to obtain business and to advise consumers on general matters relating to the supply and use of electricity.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1211, not later than 27 June, 1960.

DEMONSTRATOR

Weymouth District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.C. Grade 1 (£525/£625 per annum). N.J.C. Conditions of Service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting Z.1159, not later than 27 June, 1960.

The successful candidates for the above appointments will be required to contribute to Electricity Supply (Staff) Superannuation Scheme, if eligible. (R 177)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER
(PLANNING)

REQUIRED at No. 2 Sub-Area Headquarters, Sandiway Hse, Northwich, Cheshire. Salary within range £815/£860 per annum (N.J.B. K/13).

Applicants should preferably possess the Higher National Certificate or equivalent qualifications in Electrical Engineering, and should have had some experience in overhead and underground distribution work.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date: 27 June, 1960.

(R 183)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division

Vacancy No. 157/ET/60.

APPLICATIONS are invited for the appointment of ASSISTANT SHIFT CONTROL ENGINEERS at USKMOUTH "A" and "B" POWER STATIONS, NR. NEWPORT, MON.

Salary: Initially K.12, £860/£905 per annum plus 10% shift enhancement, rising progressively to M.12 (£965/£1,025 per annum) plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications, and have had experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 1 July, 1960. (R 157)

AN opportunity exists for a QUALIFIED ELECTRICAL ENGINEER of between 25 and 35 years old to join the editorial staff of the ELECTRICAL TIMES. Some evidence of writing ability desirable, but training in journalism will be given to the man appointed. The post offers interesting work and excellent opportunities to an engineer aiming at a broad knowledge of the electrical industry. Initial salary according to age. The position is pensionable and carries life insurance according to period of service. —Write The Editor, Sardinia House, Sardinia St, W.C.2.

A LEADING Transformer Oil Company requires the services of a suitably qualified ELECTRICAL ENGINEER for marketing their products in the north eastern area. I.E.E. member preferred. Salary according to age and experience.—Reply Box 7891, Electrical Times. (R 145)

AGENT required for the London area by a firm engaged in the manufacture of Domestic Electrical appliances—must have live connection amongst all the wholesalers in London and the Home Counties. Apply in strictest confidence giving full details to: Box No. 7901, Electrical Times. (R 189)

ASSISTANT ELECTRICAL ENGINEER required by national newspaper. Age 25/26. Electrical apprenticeship and Higher National. Must be first-class electrical draughtsman. Good prospects.—Box No. 7879, Electrical Times. (R 83)

AN ASSISTANT ENGINEER

is required by a large public company in

HONG KONG

He should preferably be under 35. Applicant must hold a Corporate or Graduate Membership of the Institution of Electrical Engineers, or equivalent qualifications, and must have sound theoretical training and practical experience in the installation and maintenance of high and low voltage underground and overhead mains, static substation plant and distribution equipment.

Salary will be approximately £2,500 per annum, payable in Hong Kong dollars. Rates of income tax in the Colony are low. First-class unfurnished quarters are provided and also free passages to and from Hong Kong together with generous home leave on full pay.

The Company also has a Provident Fund and Retirement Scheme. Applicants should write in the first instance to Box No. 7903, Electrical Times, enclosing a recent photograph and giving fullest details of education, qualifications, experience, present position, age, marital status and the date available for leaving the U.K. Arrangements will then be made for suitable applicants to be interviewed in the U.K.

(R 190)

ELECTRICAL ENGINEER

University Graduate required for Technical Sales and Development work in new Industry convenient to Belfast. The selected applicant will be given the necessary training in this new field. Initial training will be given in Belfast prior to the allocation of an area in England. Reply to Box No. 7895, Electrical Times. (R 147)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required in Ireland and Scotland. Permanent positions carrying progressive salary scale £800/£1,100 and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (R 163)

CROMPTON PARKINSON LTD. require a SENIOR TRANSFORMER DESIGNER for their Hayes Works, Middx. Applicants should have degree or H.N.C. and preferably some years' experience with transformers up to 20,000 kVA and 66 kV. with on-load tap changing gear.

Write with full particulars of age, education, qualifications and salary required to the Personnel Officer, Clayton Rd, Hayes, Middx. (R 184)

ELECTRICAL CONTRACTORS require an estimator for industrial and commercial installations. Only fully experienced men who are conversant with all types (including FLP) need apply.—Please write stating experience qualifications and salary required to Box No. 7873, Electrical Times. (R 29)

ELECTRICAL STAFF required by Consulting Engineer for installation design on interesting projects for Industry and Commerce. Two grades (a) ENGINEER DRAUGHTSMAN, age 20/27; (b) JUNIOR DRAUGHTSMAN, age 16/20 (with educational facilities). Meal vouchers, five-day week. Superannuation in higher grades. State age, experience, salary required.—G. H. Buckle and Partners, 2 Harrington Gdns, London S.W.7. (R 144)

ELECTRICAL CONTRACTORS HAVE THE FOLLOWING VACANCIES IN THEIR MANCHESTER OFFICE:

(a) **SENIOR DESIGN ENGINEER** capable of working without supervision and having a wide experience in the design of lighting and power installations, control and instrumentation cabling on large industrial and commercial projects.

(b) **ESTIMATING ENGINEERS** of proved ability in the preparation of detailed estimates for all classes of installation and cabling work, both in this country and overseas.

Application in own handwriting, state age, educational background, qualifications, experience and salary required, to the MANAGER:

DRAKE & GORHAM
(CONTRACTORS) LTD.
21 NEWTON ST., MANCHESTER 1

(R 82)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

THE CALTEX GROUP OF COMPANIES

require a

SENIOR INSTRUCTOR—ELECTRICAL APPRENTICES

for the Training Division of their Indonesian Associates. The position calls for one-third theoretical lecturing in classrooms and two-thirds practical training in the workshop. Tours of duty are of two years' duration and based at Rumbai, Sumatra; there are generous leave provisions, allowances and pension facilities.

Applicants should be male, between the age of 25 and 45 years and preferably possess an Electrical Engineering Degree. They should also have had at least three years' experience in teaching electrical theory and maintenance or a combination of suitable industrial experience and teaching.

Apply in writing to:

Caltex Services Limited,
Caltex House,
Knightsbridge Green, London S.W.1.

quoting "SUM."

(R 141)

ELECTRICIANS.—Fully qualified Electricians required for general maintenance and installation work on large integrated Iron and Steel Works. Excellent conditions—pension scheme in operation.—Apply to The Employment Officer, Appleby-Frodingham Steel Co., Scunthorpe, Lincs. (R 162)

ELECTRICAL ENGINEER required for Glasgow Office staff age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (R 164)

RENAULT MACHINE TOOLS (U.K.) LTD., SHREWSBURY, urgently requires an ELECTRICAL DRAUGHTSMAN for its factory at Monkmoor Rd, Shrewsbury. Applicants should be able to work with minimum supervision on diagrams and electrical control gear for special purpose machine tools. Some circuit design experience an advantage. Age preferably between 25 and 30. (R 185)

SENIOR ELECTRICIAN for first-class electrical installation work required by well-known concern. Two years overseas. Good opportunity. Write age, experience, copy references.—Box 7893, Electrical Times. (R 146)

SALES REPRESENTATIVE required for London area by a firm engaged in the manufacture of Domestic Electrical appliances—must have live connection amongst all the wholesalers in London and the Home Counties.

Apply in strictest confidence giving full details to: Box No. 7899, Electrical Times. (R 188)

SUPERVISING ELECTRICAL ENGINEER required. Must be fully capable of and have experience in estimating, for carrying through to finalisation all types of commercial and industrial installations. Good salary, car allowance. Permanent and progressive position. Pension and Staff Bonus Schemes. Write in confidence.—Cable Jointers Ltd., 229 High St, Acton, W.3. (R 167)

WOULD YOU LIKE TO WORK IN A PEACEFUL ATMOSPHERE WITH BEAUTIFUL COUNTRY AROUND YOU?

GROUP OF ENGINEERING COMPANIES WITH MODERN OFFICES IN HEREFORD REQUIRE:

(1) TECHNICAL AND COMMERCIAL SALES MANAGER with experience of industrial air conditioning and refrigeration for home and export.

(2) DEVELOPMENT ENGINEER.

(3) SALES ENGINEERS.

(4) REFRIGERATION, MECHANICAL AND HYDRAULIC DRAUGHTSMEN AND ESTIMATORS.

Five-day week. Contributory pension scheme. Applications, which will be treated in strict confidence, should be made in writing stating age, experience, salary required, etc., to Managing Director, Denco Works, Hereford.

(R 20)

EMP ELECTRIC LTD.
Garman Rd. Tottenham N.17. London

require

DRAUGHTSMAN

Age 25/30, for design of h.t. protective equipment. Sound training in electrical engineering is essential, but experience in lightning arresters and H.R.C. fuses is not necessary. H.N.C. standard required. Pension scheme in operation. Apply in full confidence to Technical Director, stating age, education, experience and salary required.

(R 149)

SAO PAULO LIGHT S.A.—SERVICOS DE ELETRICIDADE, a Company in Brazil and a subsidiary of the Canadian corporation Brazilian Traction, Light and Power Co. Ltd., invite applications from suitably qualified men for the position of DEPUTY CHIEF of its PIRATININGA POWER STATION. The power station was completed about five years ago and is situated near Sao Paulo (population over three millions; temperate climate, 2,200 ft above sea level). The plant comprised initially 2 x 100 MW, 1,800 r.p.m. steam turbo-generator units each supplied at 850 p.s.i., 900°C by one 850,000 lb/hr oil-fired boiler and has been recently expanded by the addition of two 125 MW reheat units, 1,800 p.s.i., 1,000°F. Applicants should have sound technical knowledge and good practical experience in the administration, operation and maintenance of steam-electric power stations; should also be of strong character with an aptitude for supervision and the maintenance of harmonious labour relations. Good salary, three years' agreement with first-class passage both ways; four months' paid leave after three years' service. Written application in the first instance should be made to Mr Osborne Mitchell, General Manager, Canadian-Brazilian Services Ltd., 9/12 Cheapside, London, E.C.2. (R 165)

TECHNICAL SALES ENGINEER with a background in small induction motor design and manufacture required for new appointment responsible for sales (with secondary production responsibilities) of special purpose motors forming small but important sector of international mechanical handling company's products. West of London area. Salary about £1,200, plus car. Box No. 7897, Electrical Times. (R 187)

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ESTIMATOR

Experienced man (25-45) required to assist in preparation of tenders for general light engineering work. Practical shop floor experience desirable as well as a ratefixing/time study/estimating background and ability to interpret drawings.—Application to Personnel Manager, Phoenix Telephone and Electric Works Ltd., The Hyde, Hendon, N.W.9. (R 166)

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Application forms available from ADMINISTRATIVE OFFICER, CENTRAL ELECTRICITY GENERATING BOARD, NORTHERN PROJECT GROUP, AGECROFT RD., PENDLEBURY, SWINTON, MANCHESTER, to be returned by not later than 22 June, 1960. Please quote appropriate vacancy number.

(R 143)

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(R 186)

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PATENTS

THE proprietor of British Patent No. 722,315, entitled "IMPROVEMENT IN APPARATUS FOR STARTING AND OPERATING GASEOUS DISCHARGE DEVICES," offers same for license or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern and Carlberg, 140 S. Dearborn St, Chicago 3, Illinois, U.S.A. (R 129)

THE Proprietors of British Patent No. 767,142 for "IMPROVEMENTS IN OR RELATING TO A CONTINUOUS SMELTING PROCESS," are desirous of entering into negotiations for the sale of the Patent, or for the grant of a Licence thereunder. Communications should be addressed to Page, White and Farrer, 27 Chancery La, London W.C.2. (R 150)

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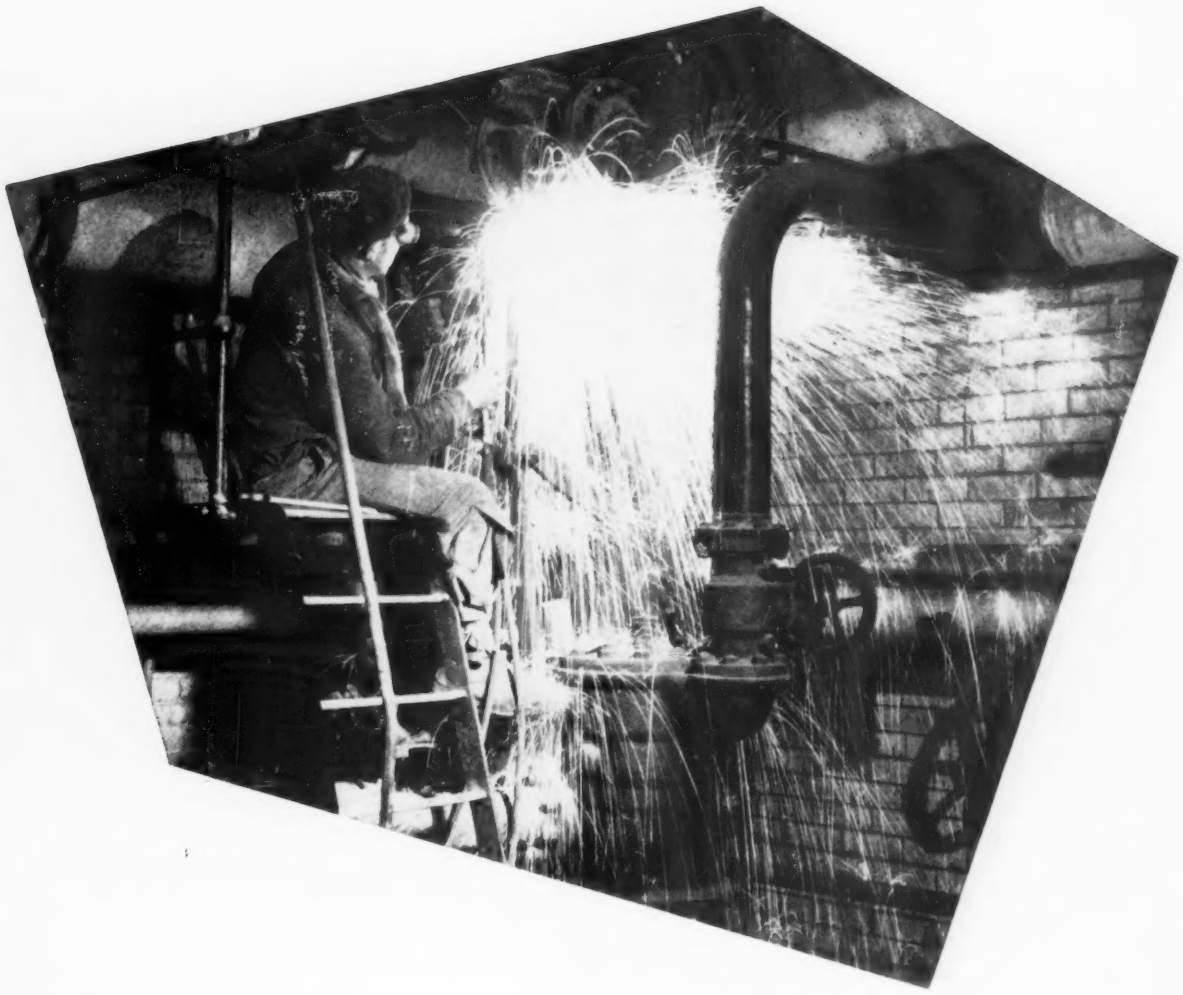

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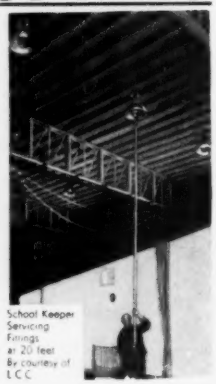

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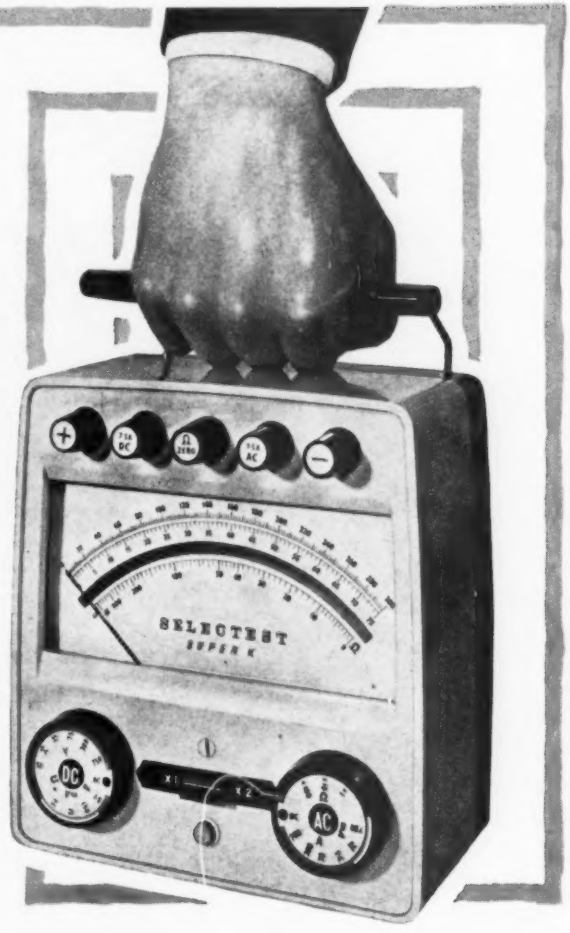

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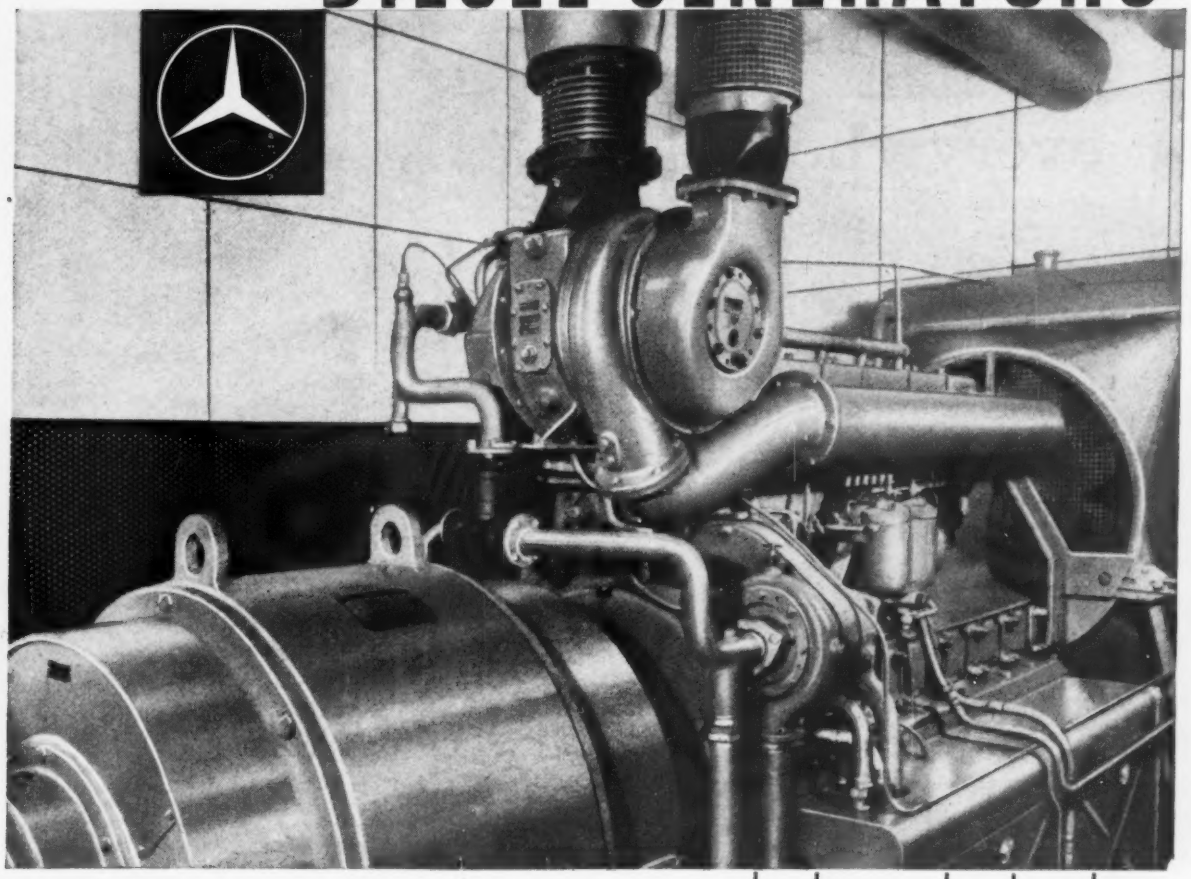

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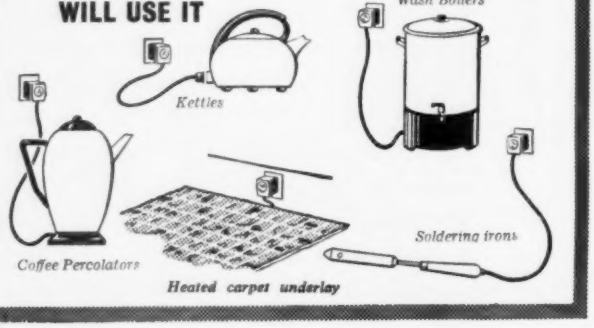

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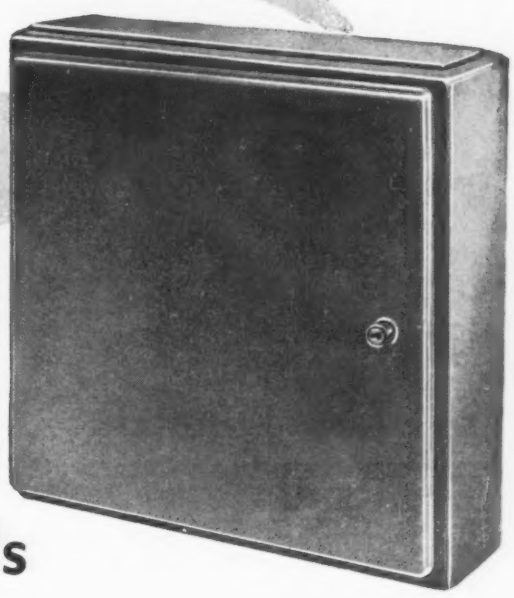

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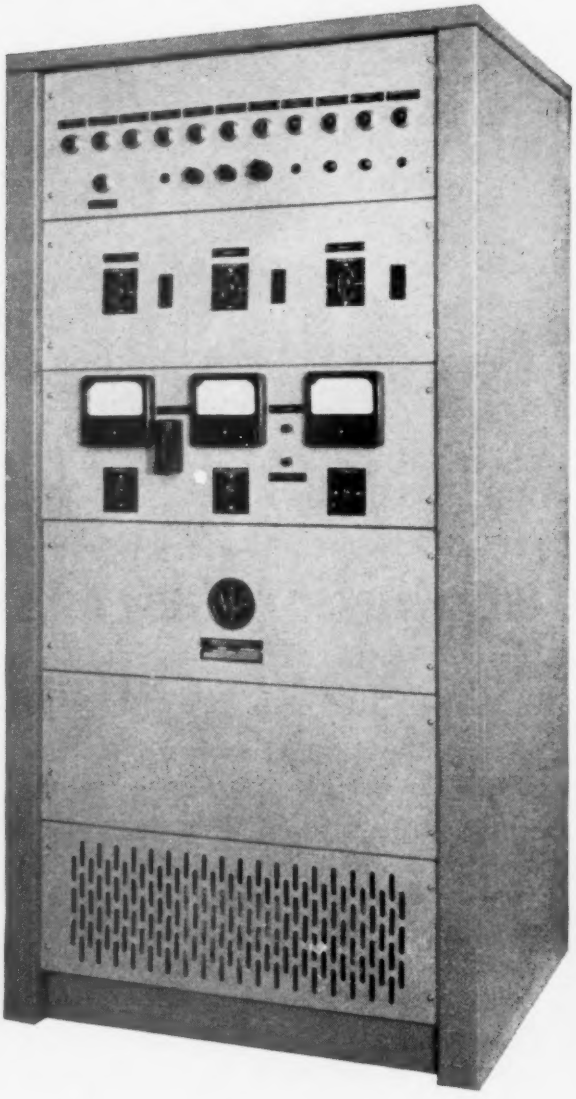

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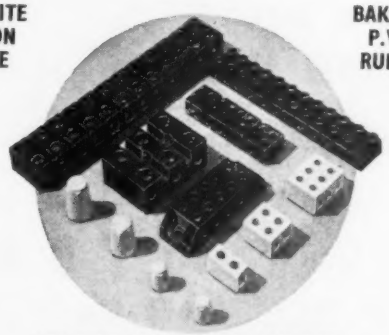

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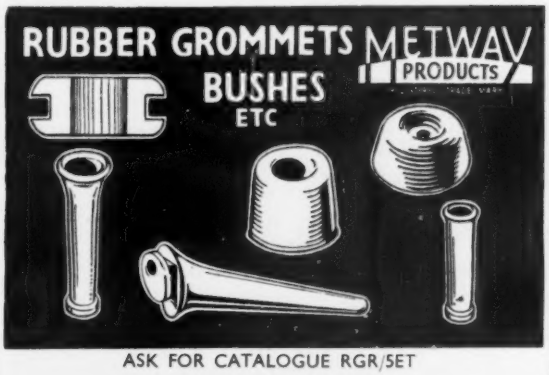

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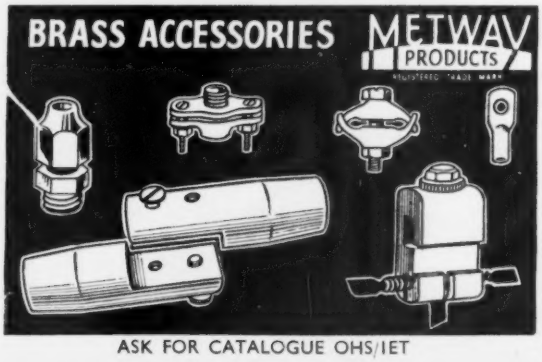

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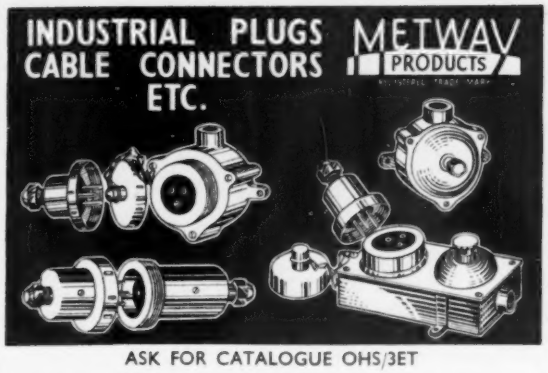

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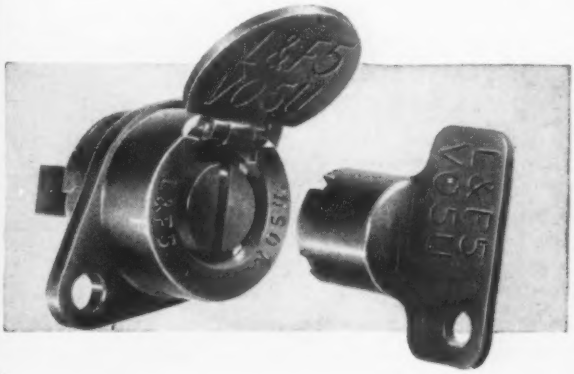

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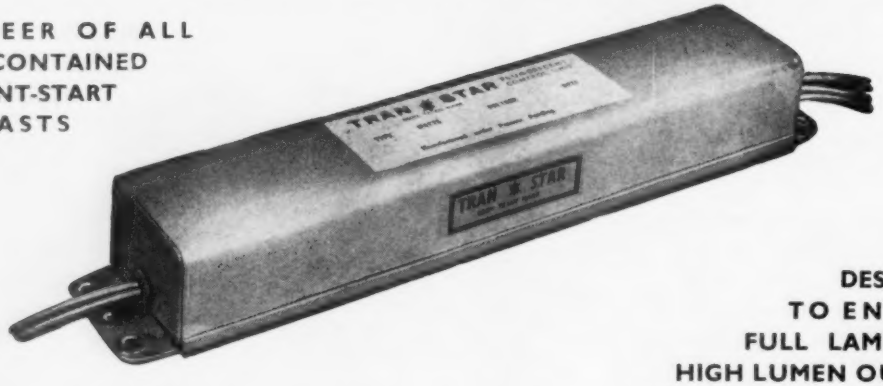

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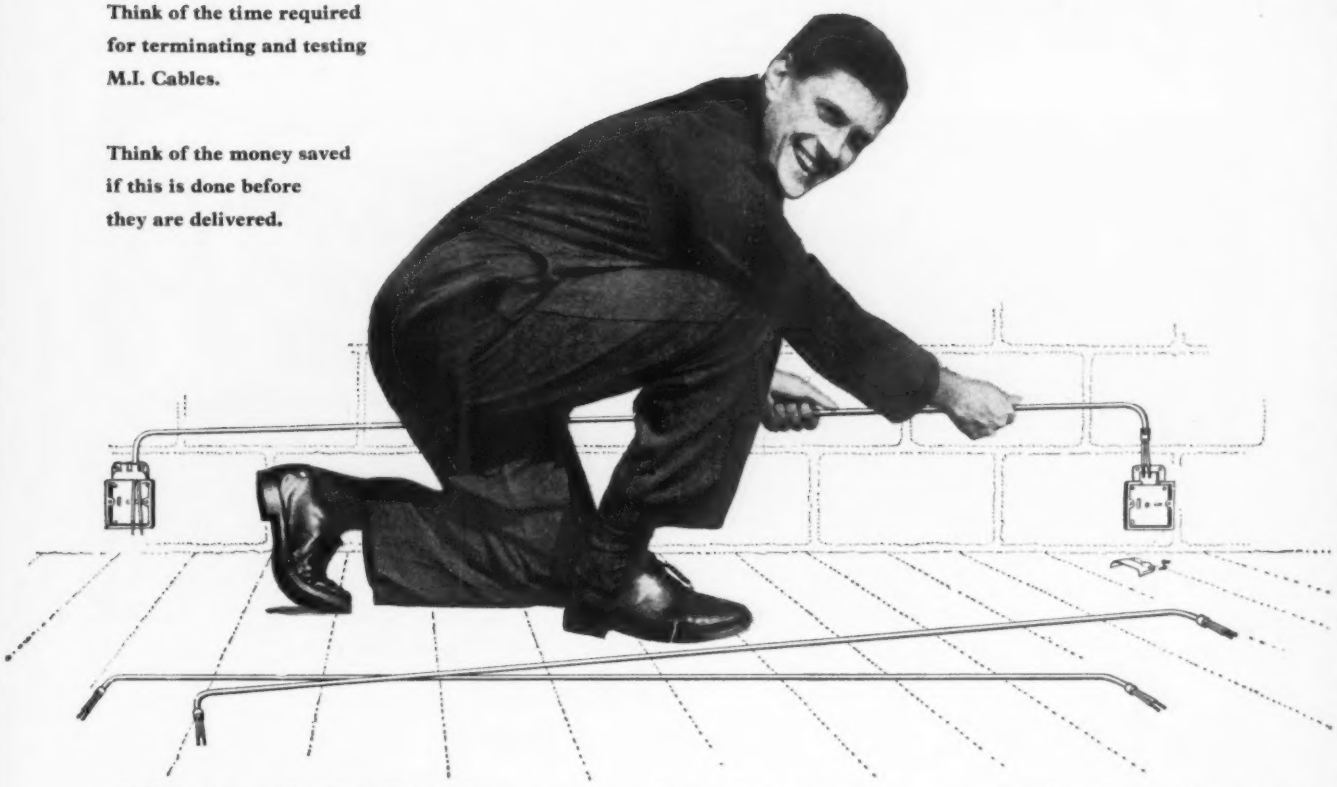
Think of the time required for terminating and testing M.I. Cables.

Think of the money saved if this is done before they are delivered.



BICC BRINGS THE FACTORY TO THE WIREMAN

Wiring units consist of M.I. cables assembled in the factory. Cables are cut to the customer's specified length, sealed — and if required fitted with glands or other accessories.

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On receipt they need only be fixed into position and connected up—just like T.R.S.

Wiring units are ideal for the repetition wiring of offices, housing estates and blocks of flats.

They can also be used to advantage in the wiring of machine tools, petrol pumps etc. Remember—M.I. cable wiring units with an oversheathing of P.V.C. offer complete protection against corrosion.

Here are Further Advantages–

There is no wastage: only the exact lengths required are supplied.

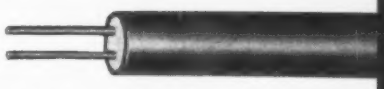
No special M.I. tools are needed.

Any wireman can install them, even without previous M.I. experience.

All units are pre-tested TWICE before leaving the factory.

The time saved leads to drastically reduced installation costs: UP TO 30%.

Any size of M.I. cable can be provided in wiring unit form and, because of factory mass production facilities, they can be produced at a very low cost providing that sufficient quantities of identical units are ordered.



M.I. CABLES

consist of fully annealed copper conductors in a compressed mineral insulant within a solid-drawn copper sheath. They are designed for both power and lighting applications, and have exceptional strength and electrical stability.

M.I. cables are fireproof, waterproof, mechanically tough, non-ageing and easily installed.

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A Body with connecting link and studs.

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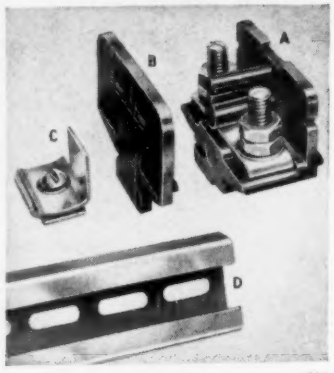
C Steel end clamp, one required at each end of group.

D Cadmium plated slotted steel channel.



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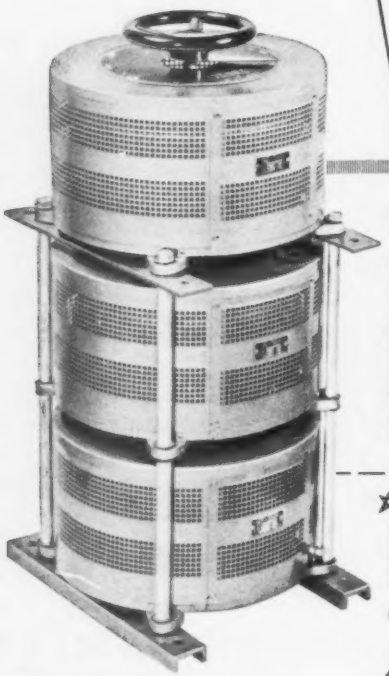

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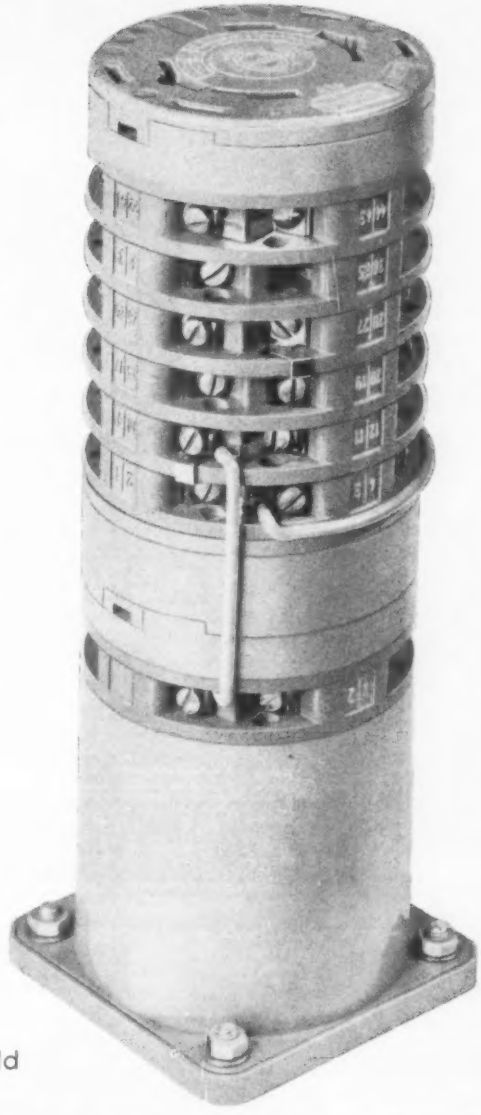

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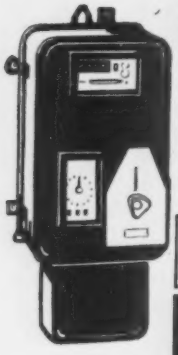

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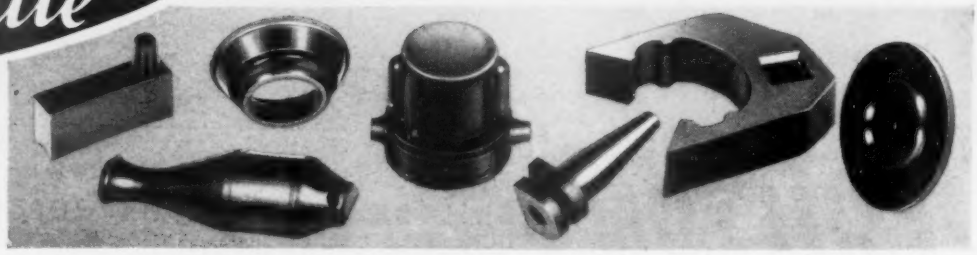

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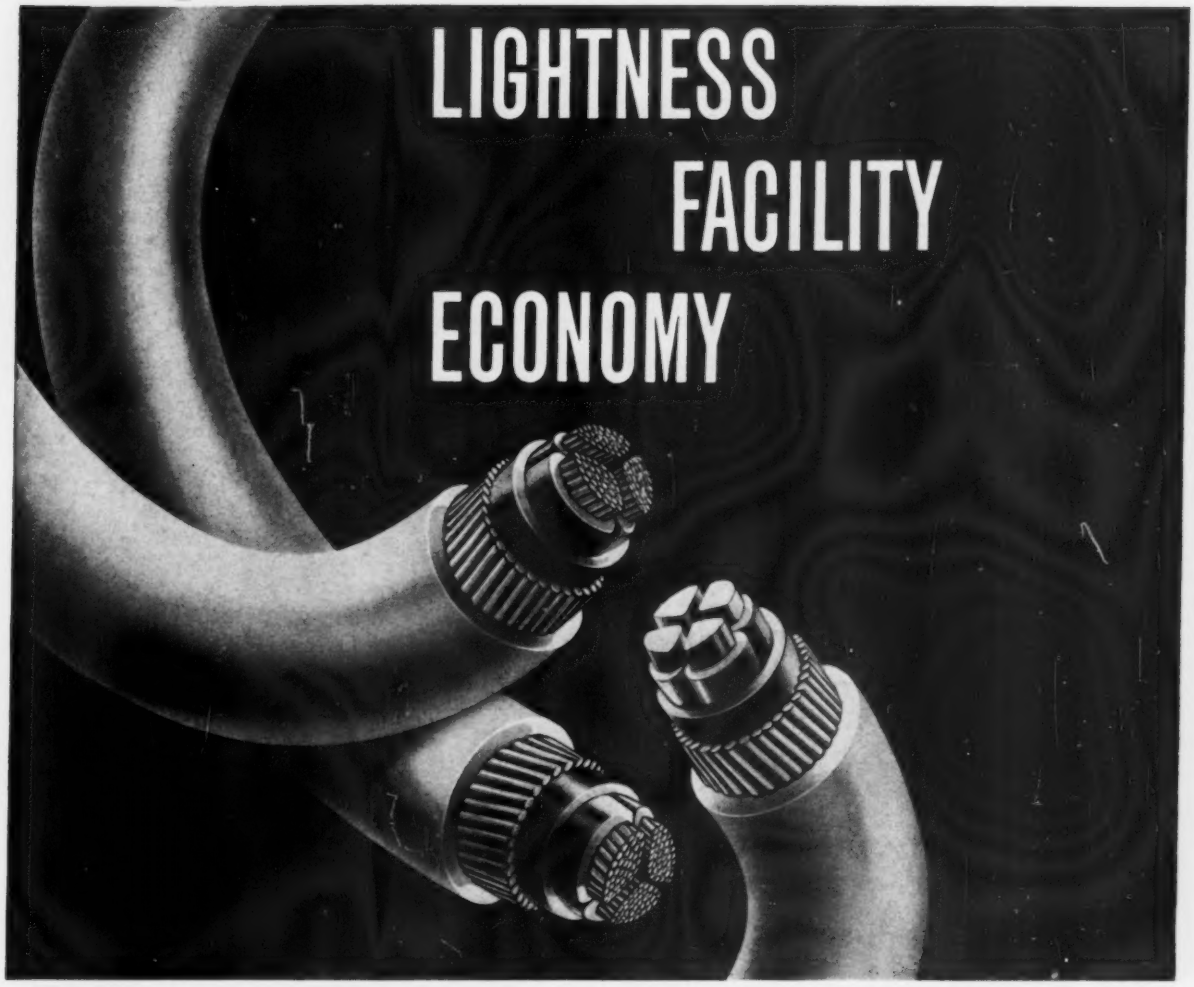

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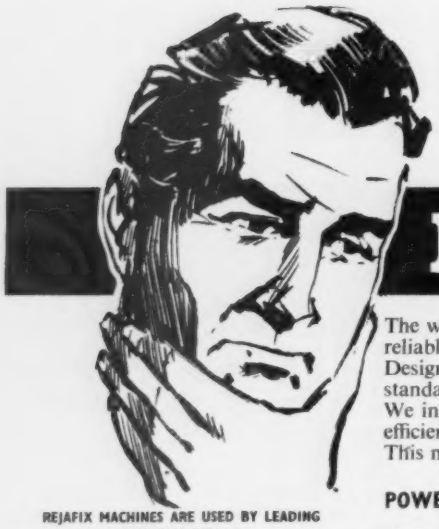

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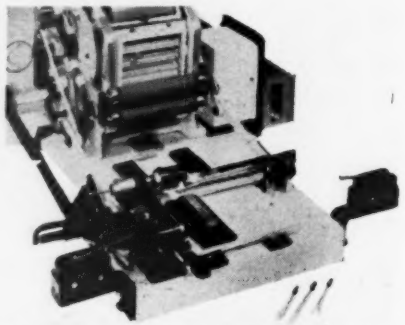

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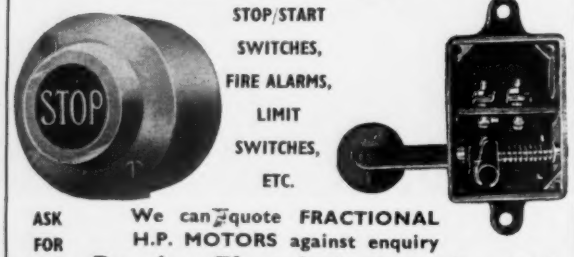

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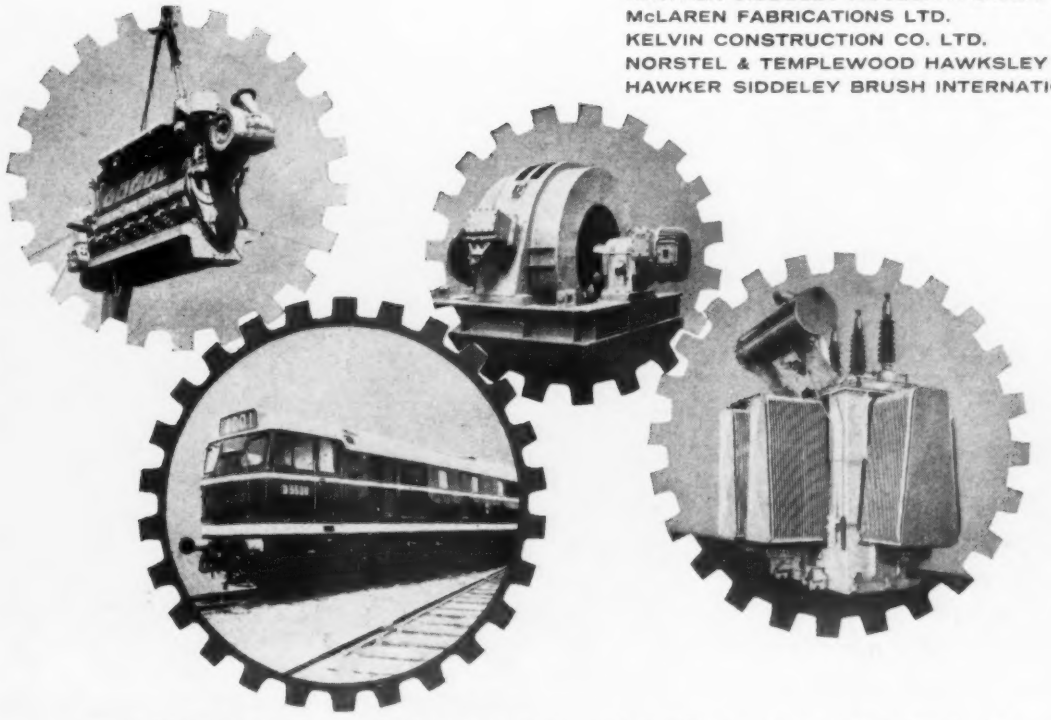

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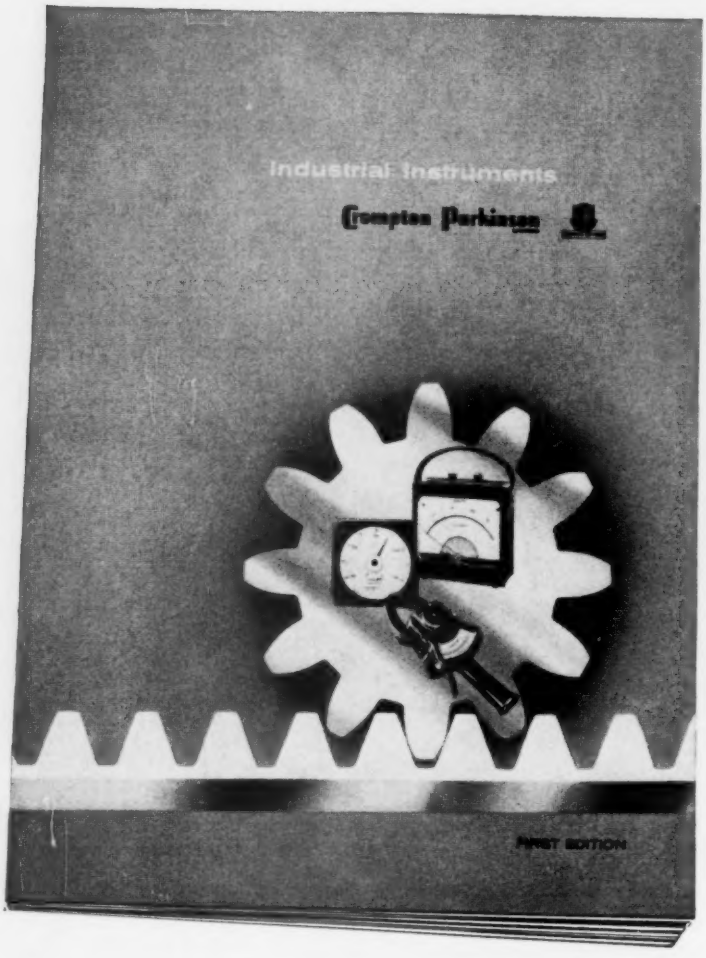

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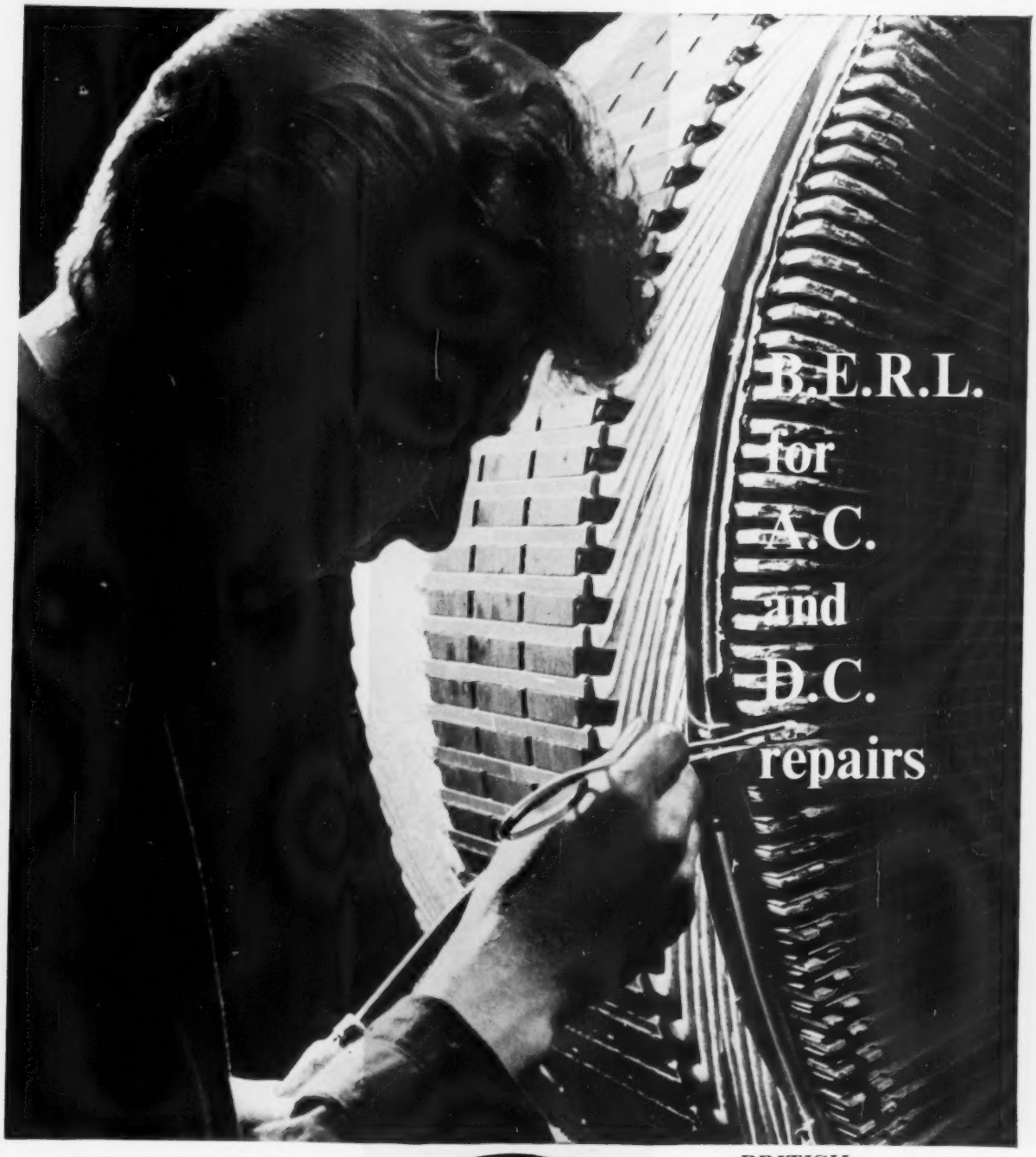

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